

The Chemical Age

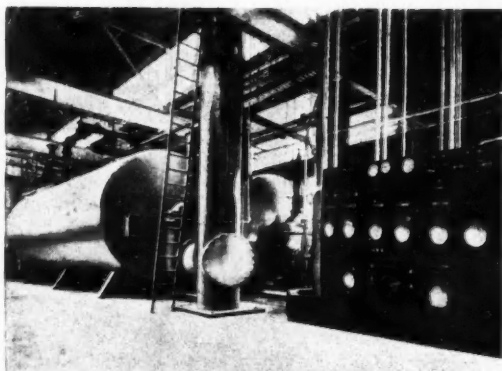
VOL LXVI

16 FEBRUARY 1952

No 1701

Solvent **ACTICARBONE** Recovery

MAR 3 1952
DETROIT



PLANT : Solvent Recovery, Drying of Gases, Distillation, Electrostatic Precipitators.

PRODUCTS : Activated Carbons, Filter Aids, Activated Earths, Bentonite, Kieselguhr.

CECA

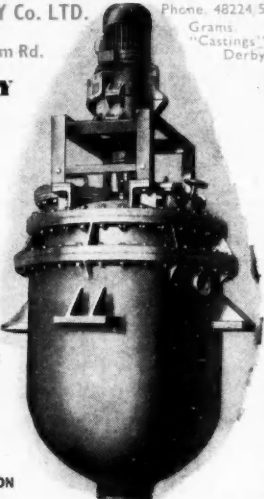
THE BRITISH CECA COMPANY LTD.

175 PICCADILLY, LONDON, W.1. Telephone : Regent 0856 (3 lines)
CABLES : ACTICARBON, LONDON

BROWNS
 FOUNDRY Co. LTD. Phone. 48224.5
 Nottingham Rd.
DERBY
 Est. 1868

GRAMS
 "Castings"
 Derby

CHEMICAL
 PLANT
 TO
 SUIT
 CUSTOMERS
 DESIGNS
 AND
 SPECIFICATION



Mirvale



Cresylic Acid

CRESOLS, PHENOL
 HIGH BOILING TAR ACIDS
 CRESYLIC CREOSOTE
 NAPHTHALINE, PYRIDINE

MIRVALE CHEMICAL CO. LIMITED
 MIRFIELD, YORKS. Phone Mirfield 2157

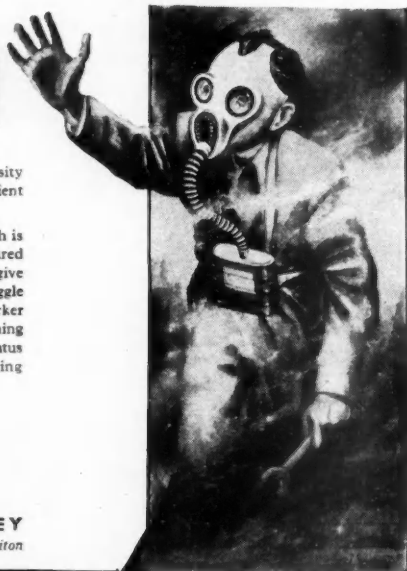
PROTECTION

IN Chemical Works, Refrigerating Plants, etc., the necessity for dealing with gas escapes and repair work calls for efficient protection of the men on the job.

This is provided by the "PURETHA" Respirator, which is comfortable, efficient and simple. Its canisters are coloured according to the gas or group of gases against which they give protection. Full mask and mouthpiece, nose-clip and goggle types. All other protective devices for the industrial worker also manufactured and supplied: Self-contained breathing apparatus, smoke-helmets, short-distance fresh-air apparatus resuscitating apparatus, dust masks, protective clothing goggles, etc.

SIEBE GORMAN & CO. LTD.
 LONDON
 EVERYTHING FOR SAFETY EVERYWHERE

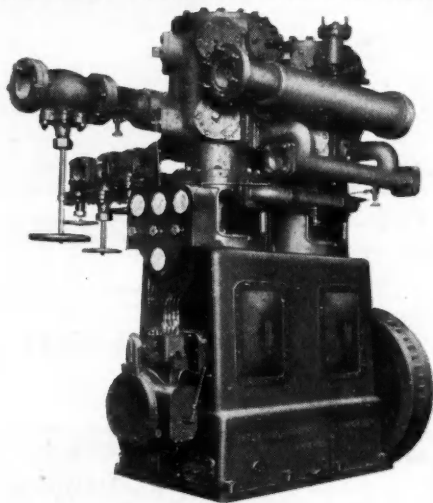
TOLWORTH, SURBITON, SURREY
 Telephone: Elmbridge 5900 Telegrams: Siebe, Surbiton



BROTHERHOOD

Air, Gas and Refrigerating
Compressors

For the manufacture of
ARTIFICIAL FERTILISERS and other CHEMICALS



Also
**STEAM TURBINES
STEAM ENGINES
GENERATING SETS**

Literature describing Brotherhood Products available on request



PETER

BROTHERHOOD

PETERBOROUGH ENGLAND

COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

Safety First

SAFETY FIRST

THE "OLDBURY" PATENT
CARBOY DISCHARGER
will empty and elevate up to 50 feet
the contents of any carboy, bottle or
vessel, and complies with all the con-
ditions of the Factory Act of 1937.

KESTNER'S

8, Grosvenor Gardens, Westminster, London, S.W.

H. PULFORD

& CO., LTD.

GENERAL COOPERS

for

DRUMS
BARRELS
CASKS

Phone
LEEDS 38100

COLTON RD., ARMLEY, LEEDS, 12

CHEMICAL PLANT

TO ALL
SPECIFICATIONS



M.S. Jacketed
Autoclave with
winch lifting
gear for cover.
60lbs. per sq.
inch working
pressure.

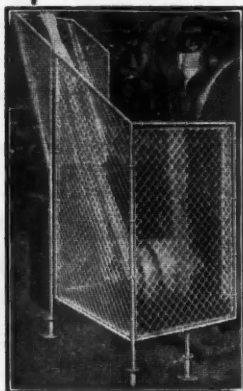
We design and
fabricate all
types of M.S.
and S.S. Tanks
and Vessels.

BY

YEWCO

YORKSHIRE ENGINEERING & WELDING CO. (Bradford) LTD.
Dept. C., Friar's Works, Bradford Road, Idle, Bradford.
Tel. Idle 470 (3 lines) Telegrams : YEWCO, BRADFORD

POTTER'S Machinery Guards



● DESIGNED
FOR SAFETY

● BUILT
FOR SERVICE

Potter's guards
are installed in
works through-
out the country
and are distin-
guishable by their
sound construc-
tion, good fitting
and many exclu-
sive features.

F.W. POTTER & SOAR LTD

PHIP STREET, LONDON, E.C.2
Telephones : BISHOPSGATE 2177 (3 lines)

"EVERTRUSTY" FOR PROTECTION EVERYWHERE



HANDS



BODY, LIMBS,
HEAD AND FEET



EYES



NOSE AND
LUNGS

"Evertrusty" book-
lets No. 2 gladly
sent on request

WALLACH *BROS. Ltd*

49 TABERNACLE STREET, LONDON, E.C.2 CLE. 1448-9

INDEX TO ADVERTISERS IN THIS ISSUE

	Page		Page
Altrincham Jute, Ltd.	xvi	Metway Electrical Industries, Ltd.	xvii
Baker Perkins, Ltd.	v	Mirvale Chemical Co., Ltd.	Cover ii
Braby, Fredk., & Co., Ltd.	viii	National Enamels, Ltd.	Cover iii
British Ceca Co., Ltd.	Front Cover	Nordac, Ltd.	xii
British Electrical Development Assoc.	xiii	Norton & Riding (Yorkshire), Ltd.	xvi
Brotherhood, Peter, Ltd.	i	Permutit Co., Ltd. (The)	289
Browns Foundry Co., Ltd.	Cover ii	Pott, Cassels & Williamson	viii
Callow Rock Lime Co., Ltd., The	Cover iii	Potter, F. W., & Soar, Ltd.	ii
Classified Advertisements	xiv, xv, xvi	Powell, Duffryn Carbon Products, Ltd.	x
Farnell Carbons, Ltd.	xviii	Prodorite, Ltd.	Cover iii
General Asphalte Co., Ltd., The	vi	Pulford, H., & Co., Ltd.	ii
Guest Industrials, Ltd.	vi, 292	Pulsometer Eng. Co., Ltd.	xii
Hess Products, Ltd.	ix	Reads, Ltd.	Cover iv
Holmes, W. C., & Co., Ltd.	iv	Robinson, F., & Co., Ltd.	291
Jackson, E., & Co.	xviii	Siebe Gorman & Co., Ltd.	Cover ii
Kestner Evaporator & Eng. Co., Ltd.	ii, iv	Spencer Chapman & Messel, Ltd.	292
Kilner, John, & Sons (1927), Ltd.	xviii	Staveley Iron & Chemical Co., Ltd. (The)	iii
Lennox Foundry Co., Ltd.	xvii	Stelcon Industrial Floors, Ltd.	vii
Marchon Products, Ltd.	xi	Wallach Bros., Ltd.	ii
		Wallis, Charles, & Sons (Sacks), Ltd.	xviii
		Yorkshire Engineering & Welding Co. (Bradford), Ltd.	ii
		Yorkshire Tar Distillers, Ltd.	xviii



Playing an important role in Pharmaceutical and processing industries Staveley Toluol is a base from which dissimilars such as car finishes, saccharine, industrial explosives and dyestuffs have their origin.

Staveley produces the prime basic chemicals which are indispensable to Britain's Industries, Public Health services and Agriculture.

STAVELEY

BASIC CHEMICALS FOR INDUSTRY

SULPHURIC ACID • CHLORINE • CAUSTIC SODA • SULPHATE OF AMMONIA • COAL TAR DERIVATIVES

THE STAVELEY IRON & CHEMICAL CO. LTD.

NR. CHESTERFIELD

THE KESTNER T.V. DRIER

RECENTLY DEVELOPED ESPECIALLY FOR
DRYING FILTER PRESS CAKES AND
SEMI-SOLIDS

Several years of research and development work in our plant laboratories, combined with extensive operational experience, enables us to offer the Kestner T.V. Drier as the most

satisfactory plant for handling damp materials and semi-solids.

Outstandingly successful results are being obtained in drying filter cakes, centrifuged materials and deposited sediments such as:—

**Chalk, China Clay, Stearates, Boracic Acid, Coal
Dust, Sand, Bicarbonate, certain Synthetic Resins, etc.**

The process is based on fundamentally simple thermogravic and aerodynamic principles.

OUTSTANDING ADVANTAGES

1. **SIMPLICITY.** The only moving parts are feeder and fans. The only controls are the supply of steam or fuel to the heater, and regulation of the rate of feed.

2. **EFFICIENCY.** The thermal efficiency is extremely high—no other drying system can show better results.

3. **COMPACTNESS.** The plant takes up very little space.

Please write for Leaflet No. 278.

KESTNER'S

Chemical Engineers, 5, GROSVENOR GARDENS, LONDON, S.W.1

DUST REMOVAL

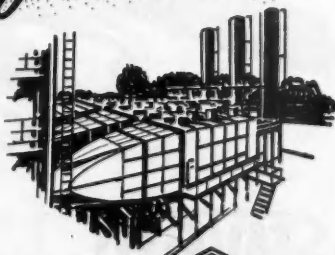
from flue gases

by

HOLMES ELEX

Electrical Precipitators

Typical Installations: Cement Plant, Gypsum Plant, Blast Furnace Plant, Power Stations, Acid Plant, Aluminium Plant, Etc., as fully described in Brochure No. 42.



W. C. HOLMES & CO. LTD., HUDDERSFIELD

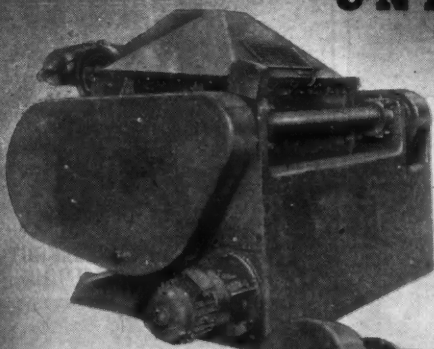
Telephones: Huddersfield 5280

London, VICTORIA 9971

Birmingham, MIDLAND 6830

**HOLMES
ELEX**

UNIVERSAL MIXERS

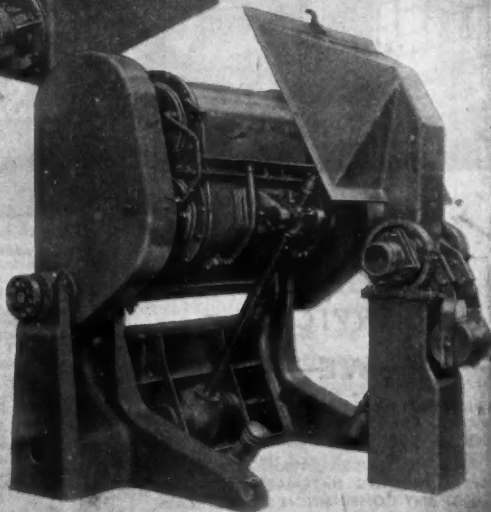


FRONT VIEW

A typical "Universal" is illustrated here. Capacity 110 gallons per mix. Note the clean design, the efficient screw tilt and the counter-balanced hood.

There are thousands of our mixers in use to-day many of which were built before this century.

Consult us on any special mixing problem you have and we will experiment without fee or obligation.



REAR VIEW

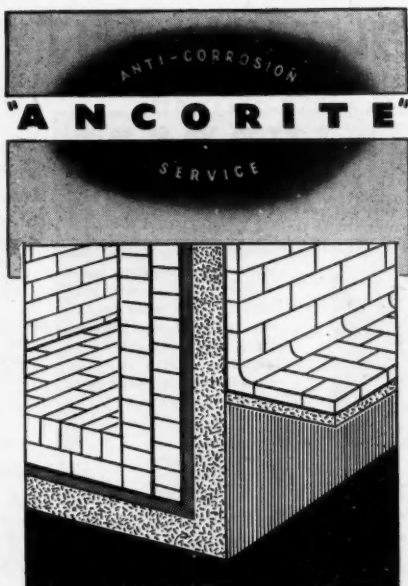
BAKER PERKINS

Engineers LTD

WESTWOOD WORKS - PETERBOROUGH

erials
being
auged
s:—

W.I



A COMPREHENSIVE THREE-POINT ANTI-CORROSIVE SERVICE

WE

- ★ CONSTRUCT ACID, ALKALI AND OIL PROOF LININGS FOR TANKS AND INDUSTRIAL FLOORS
- ★ SUPPLY JOINTING MATERIALS TO WITHSTAND ANY COMBINATION OF CHEMICAL AND PHYSICAL CONDITIONS
- ★ ADVISE ON PROBLEMS AND RECOMMEND SPECIFICATIONS ON REQUEST

Please write for full particulars to :

**CHEMICAL ENGINEERING DIVISION OF
THE GENERAL ASPHALTE CO. LTD**

A THREE POINT ANTI-CORROSIVE SERVICE

HOPE HOUSE, GREAT PETER ST., LONDON, S.W.1

Telephone : ABBEY 3232 (7 lines)
Grams : GENASPHALT, SOUTHWEST

AB BOFORS, NOBELKRUT
can now offer for prompt shipment :—

SACCHARIN

450X & 550X

In addition, their wide range of other Chemical and Pharmaceutical products include :—

Para Dichlorobenzene · 2,4. Dinitro toluene · Benzocaine B.P. · Ortho-Toluene sulphonamide · Para-Toluene sulphochloride · Formaldehyde · Chloramine T. · Para Amino benzoic Acid B.P. · Para Nitro benzoic Acid · Procaine Hydrochloride B.P. · etc., etc.

AB BOFORS, NOBELKRUT
BOFORS—SWEDEN

Write for samples and prices to the Sole Selling Agents :—

GUEST INDUSTRIALS LTD.
Raw Materials Division

81, GRACECHURCH STREET, LONDON, E.C.3. Telephone: MANsion House 5631 (18 lines). Telegrams: Guestind, London. Sub-Agents in Scotland: H. M. Roemmel & Co. Ltd., 65 West Regent Street, Glasgow, C.2. Sub-Agents in Australia: John Beith & Co. Pty. Ltd., Melbourne and Sydney.

GOI
SERVICE

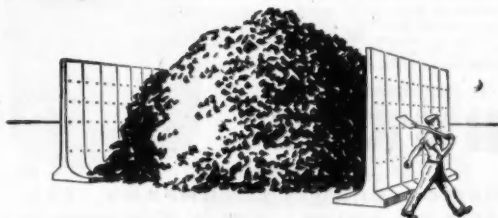
A Harris and Dixon Company

What's best for **Coal?**



Wasteful, unsightly, heaps—or

neat, economical,
storage bays?



If you pride yourself on having a place for everything, and then keeping everything in its place, remember that Stelcon Storage Walls are specially designed to keep *loose bulk materials in their place*.

STELCON STORAGE WALLS which can be of 4 different heights, and made up of 2 ft. sections to any length or breadth, are easily erected and dismantled. They are practically everlasting, need no maintenance or painting, and cannot rust, or stain. They are more adaptable than permanent walls, and besides being clean and neat, reduce pilferage and storage losses.

STELCON STORAGE WALLS the perfect bulk-storage system, indoors or out, for Coal, Coke, Fuel, Scrap, Chemicals, Grain, Gravel, Sand, Flour, Cocoa, and all forms of bulk material.

YOU GET NEATER, CLEANER, SAFER STORAGE WITH

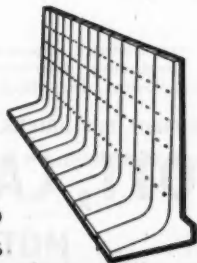
Stelcon STORAGE WALLS

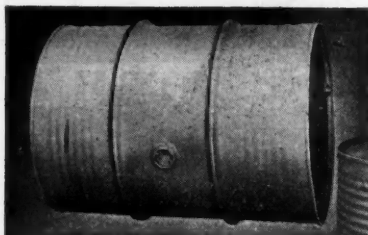
Please write for illustrated technical leaflet Dept. C.A. 4.

STELCON INDUSTRIAL FLOORS, LIMITED

Cliffords Inn, London, E.C.4

Telephone: HOLborn 2916





"BRABY" REGD.

Steel Drums

SINGLE TRIPPER AND
RETURNABLE TYPES

Our factory at Liverpool is designed and equipped for the production of high grade steel drums of many types, which can be supplied Painted, Galvanized, Tinned or Lacquer lined. Certain types can also be made from Stainless Steel

One of the wide range of

BRABY

P R O D U C T S

FREDERICK BRABY & COMPANY, LTD.

HAVELOCK WKS., AINTREE, LIVERPOOL, 10. Tel: Aintree 1721

FITZROY WORKS, 352-364 EUSTON RD., LONDON, N.W.1. Tel: EUSTON 3456

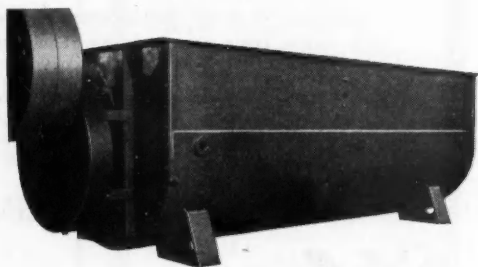
EXPORT: 110, CANNON STREET, LONDON, E.C.4. Tel: MANSION HOUSE

6034. Also at Glasgow, Bristol, Belfast and Plymouth.



DEXTRINE AND BRITISH GUM PROCESSING THIRD STAGE: COOLING

After starch has been converted to Dextrine (or Gum), cooling is necessary before dressing and bagging. The Belt driven Cooler illustrated is fitted with a cold water jacket, and has a triple spiral shaft circulating the Dextrine during temperature reduction. These coolers are also made circular and totally enclosed, with electric drive.



We manufacture complete plant for producing Dextrines and British Gums, including

ACIDIFIERS, PRE-DRIERS, BLENDERS, FURNACES AND FANS, ELEVATORS AND CONVEYORS

POTT, CASSELS & WILLIAMSON

MOTHERWELL • SCOTLAND

Fatty acids

by Fractional Distillation



The Hess Products plant is producing fatty acids to standards of purity unapproachable by any other process on an industrial scale. Highly pure fatty acids enable you at once to simplify your manufacturing problems and to improve your product. Those listed are available for delivery in bulk.

CAPRYLIC-CAPRIC
 $C_7H_{15}COOH$ and $C_9H_{19}COOH$
LAURIC

 (90% pure)
 $C_{11}H_{23}COOH$
MYRISTIC

 (90% pure)
 $C_{13}H_{27}COOH$
PALMITIC

 (90% pure)
 $C_{15}H_{31}COOH$
COMMERCIAL STEARIC
 $C_{17}H_{35}COOH$
**MIXED
UNSATURATED
ACIDS**

Prices and samples on request from

HESS PRODUCTS LIMITED

4 ALBION STREET • LEEDS 1

Selling agents to paint and printing ink industries

LEON FRENKEL LIMITED • 28a BASINGHALL STREET • LONDON E.C.2

"DELANIUM" GRAPHITE HEAT EXCHANGERS



CORROSION RESISTANCE

"DELANIUM" graphite combines complete resistance to corrosion with thermal conductivity more than twice that of stainless steel or lead.



ROBUSTNESS

The assembly is of robust design and has great strength. The Unit will withstand working pressure differentials of over 200 lbs. per sq. inch.



VERSATILITY

Adaptable for use as a condenser, evaporator or heat exchanger.

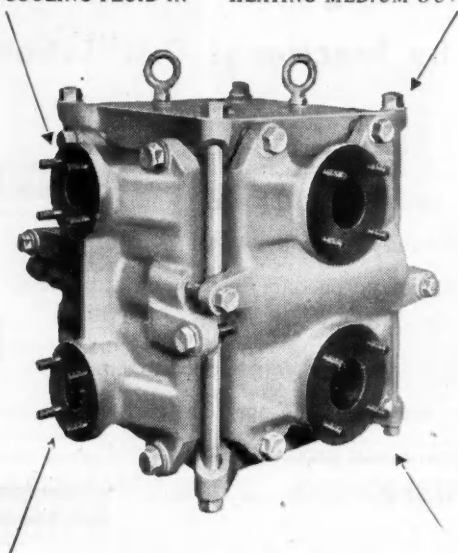


PERFORMANCE

TYPICAL PERFORMANCE FIGURES FOR MODELS Nos. 3, 5 and 7 ARE:—

Effective Heat Transfer Area	Total heat transmitted under specific conditions.
50.0 sq. ft.	5,250,000 B.Th. U/hr. between steam and a liquid.
105.0 sq. ft.	2,200,000 B.Th. U/hr. between two corrosive liquids.
105.0 sq. ft.	90,000 B.Th. U/hr. between corrosive liquid and gas.

COOLING FLUID IN HEATING MEDIUM OUT



COOLING FLUID OUT HEATING MEDIUM IN

Model No. 3

Overall Dimensions 15" x 15" x 15"

Heat Transfer Area 50 sq. feet



"DELANIUM" graphite heat exchangers are made from readily obtainable British raw materials and are available in quantity for early delivery.



Full technical data will be given on request and P.D. Chemical Engineers will gladly investigate any corrosion problem to which "DELANIUM" might provide the solution.


POWELL DUFFRYN CARBON PRODUCTS LTD.

Chemical Carbons Division, Springfield Road, Hayes, Middx
Telephone: Hayes 3994/8



at last - the ALL-PURPOSE DETERGENT !

For the formulation of compounds for washing cars  and trains  and even

buildings  for the preparation of glass-cleaning detergents for dairies, hotels etc. 


for cleaning, treating or pickling metal in alkaline or acid solutions  for wetting

textile fibres  washing fruit and vegetables

 for agricultural sprays  and

insecticides, for packing as a synthetic detergent

as such  or for compounding with great

ease into detergent and scouring powders 

the ideal base for every type of detergent is

NANSA S. POWDER



Containing 40% Dodecyl Benzene Sodium Sulphonate and 56% Sodium Sulphate, a trace of P_2O_5 and about 4% H_2O —now available in highly soluble TOTALLY SPRAY-DRIED powder form—the advantages of which are immediately appreciated; economical and easy to handle; non-dusty; free-flowing, non-hygroscopic; ideal for mixing with other builders and diluents

in the formulation of detergents, etc. NANSA is the trade name covering a wide range of alkyl aryl sulphonates of our manufacture:—
NANSA H.S. PASTE
NANSA A. LIQUID
NANSA D. POWDER
NANSA U.C. POWDER
Detailed literature and samples on request to the nearest MARCHON SALES OFFICE or any of our FOREIGN REPRESENTATIVES.

HEAD OFFICE

MARCHON PRODUCTS LIMITED WHITEHAVEN CUMBERLAND

Telephone: Whitehaven 650/1/2 & 797/8/9.

SOUTHERN SALES OFFICE:

36, Southampton Street, Strand, London W.C.2.

Tel.: TEMPLE BAR 5358.

Grams: Marchonpro, Rand, London.

Telegrams: Marchonpro, Whitehaven.

LANCASHIRE SALES OFFICE:

1, Booth Street, Manchester, 2.

Tel.: BLACKFRIARS 7778

Grams: Marchonpro, Manchester.

NORTHERN IRELAND SALES OFFICE

7, Bedford Street, Belfast. Tel.: Belfast 26798

Marchon

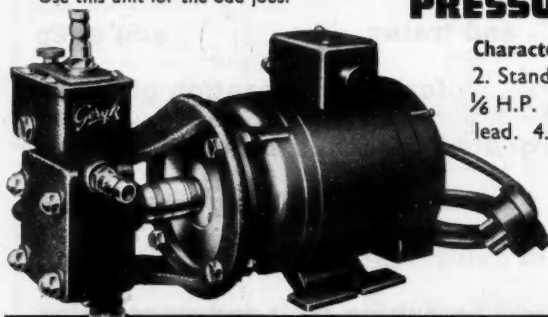
n.d.h.

Pulsometer



RESEARCH WORKERS Save your high vacuum pumps for high vacuum work. Use this unit for the odd jobs.

Geryk **VACUUM or PRESSURE PUMPS**



Characteristics: 1. Portable. 2. Stands on the bench. 3. $\frac{1}{8}$ H.P. motor with trailing lead. 4. Easy to clean and service. 5. Swept volume: 1 cu.ft./min. 6. Vacuum .01 M/M. 7. Pressure 10lb/ per square inch.

Pulsometer Engineering Co. Ltd.
Nine Elms Ironworks, Reading.

"NORDAC"

REGD.
SOFT RUBBER LINING OF OLD
OR NEW TANKS AT OUR WORKS
OR ON SITE

"VULCOFERRAN"

REGD.
SPECIAL EBONITE LINING FOR
HIGH TEMPERATURE WORK

DESIGN AND CONSTRUCTION OF SPECIAL PURPOSE
PLANT A SPECIALITY

NORDAC LIMITED

COWLEY MILL ROAD,
UXBRIDGE, MIDDLESEX.

TELEGRAMS: "NORDAC," UXBRIDGE.

'PHONE: UXBRIDGE 5131

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4

Telegrams: ALLANGAS FLEET LONDON • Telephone: CENTRAL 3212 (26 lines)

Volume LXVI

16 February 1952

Number 1701

King George VI

A SHADOW of grief lies over the British Commonwealth and Empire. The untimely death of His Majesty King George VI, who by his courage and high sense of duty, endeared himself to his subjects in all parts of the world, came as a sad blow, particularly as he seemed to be making steady progress from his illness and operation in September last year. King George VI built himself a special place in the affections of his people and by his own efforts brought to the monarchy a touch of humility and greatness that was unique.

As Duke of York he was called upon suddenly and in unprecedented circumstances to fill a vacant throne, caused by the abdica-

tion of his elder brother. How successfully he overcame these difficult circumstances by his determination, perseverance and untiring efforts to serve his country, has been proved

by the loyal affection and esteem which he inspired, and which it is hoped may have been realised by him to be some reward for, and recognition of his life of sacrifice.

After the 1914 war he was sent to Cambridge University and later began that serious study of economics and industrial welfare and efficiency that was to stand him in such good stead and surprised so many

people when he came to take on the many and varied tasks of a king.

His Majesty's interest in the welfare



Copyright, Dorothy Wilding, Ltd.

of the youth of the country was exemplified by the organisation in 1921 of his camp for public school boys and lads from working class homes. As the scheme progressed, the Duke of York, as he then was, made it an annual engagement to join the boys, entering wholeheartedly into their activities. It must indeed have been a source of gratification to him that 30 years later his original idea should have proved so excellent that there are now a number of schools and firms which have organised camps run on similar lines. On 17 March, 1937, His Majesty formally opened King George's House, Stockwell, present headquarters of the John Benn Boys' Hostels Association.

Interest shown by King George VI in his people was perhaps nowhere better typified than in his presidency of the Industrial Welfare Society, of which he himself said: 'I get a great deal of pleasure as president of the Industrial Welfare Society, for it has brought me into touch with numbers of men and women whom otherwise I should never have met and I have been able to see nearly every industry in the country.'

During the 15 years of his reign, science and technology have made immense strides and King George VI always showed a keen desire to keep abreast of the developments. In the period of reconstruction after the war one of his first important engagements was to attend the centenary celebrations of the Imperial College of Science. He was proud of the connection between the Royal Family and the college, which had been virtually founded by the Prince Consort.

Last year his interest in science was again demonstrated not only by his official opening of the Festival of Britain exhibition on South Bank, but by his visits before and after the event. He was patron of the Royal Society, the British Association for the Advancement of Science, the Royal Institute of Chemistry and the Chemical Society.

No one realised better than His Majesty that the Crown has now become the sole remaining link uniting in-

definably a group of independent nations, and this no doubt inspired in him the desire to become personally acquainted with the overseas members of his 'family.' His visit to Canada began the fulfilment of this notion and was followed after the war by his triumphal tour of South Africa. No one, it is certain, was more distressed than King George VI himself, when illness prevented him from completing this 'family' progress and his journey to Australia and New Zealand had to be cancelled.

During the war he shared with his subjects the dangers of the great air attacks on London. Buckingham Palace was twice bombed in a week. Accompanied by the Queen he frequently visited stricken areas in and around the capital. In September 1940 he announced the creation of the George Cross.

That the new Queen is a worthy successor to her father is already recognised, for young as she is, she has already won the warm affection of her countless subjects in all parts of the globe. It must indeed have been a source of pride and consolation to King George VI to realise how worthily she would carry on the highest traditions of self-abnegation and public service set by himself.

The Queen begins her reign secure in the knowledge of the devotion and loyalty of her peoples everywhere and fortunate in the companionship of her husband the Duke of Edinburgh who has already proved himself to be a solace and strength to whom she can turn with confidence for guidance and help.

The importance of science in world affairs today is fully appreciated by Her Majesty, who as Princess Elizabeth was president of the Royal Society. The Duke of Edinburgh is also keenly interested in scientific affairs, of which he has a sound knowledge, as was demonstrated by his address as president of the British Association for the Advancement of Science at its meeting in Edinburgh last year. Only a few days ago he was elected the first Honorary Fellow of the Royal Institute of Chemistry.

U.K. Sulphuric Acid Returns

Production & Consumption in 1951

PRODUCTION of sulphuric acid and oleum (chamber and contact) in the United Kingdom during 1951 amounted to 1,606,078 tons which was 196,621 tons less than the total output in 1950.

In the final quarter of last year production totalled 410,228 tons compared with 449,621 tons in the same period of 1950, while stocks at the end of the last three months of 1951 (in tons) were: pyrites, 111,255; spent oxide, 247,679; sulphur and H₂S, 74,931; zinc concentrates, 53,161; anhydrite, 370.

Figures for the year 1951, reproduced in the tables below, are from the summary issued by the National Sulphuric Acid Association, Ltd.

PRODUCTION OF SULPHURIC ACID AND OLEUM
(Tons of 100% H₂SO₄)

Data ex-Acid Makers' Returns	Chamber only	Contact only	Chamber and Contact
Stock, 1st Jan., 1951	32,046	37,210	69,256
Production ..	618,480	987,598	1,606,078
Receipts ..	85,929	79,720	165,649†
Oleum feed ..	—	6,425	6,425
Adjustments ..	745	—	721
Use ..	347,826	490,046	837,872
Despatches ..	354,240	578,803	933,043
Stock, 31st Dec., 1951	33,644	42,128	75,772
Total capacity represented ..	791,010	1,250,480	2,041,490
Percentage production ..	78.2%	79.0%	79.7%

† Includes 23,148 tons of imported acid.

RAW MATERIAL
(Tons)

Data ex-Acid Makers' Returns	Pyrites	Spent Oxide	Sulphur and H ₂ S	Zinc Concentrates	Anhydrite
Stock, 1st Jan., 1951 ..	59,465	192,631	62,977	48,845	525
Receipts ..	257,656	306,637	289,292	164,183	178,222
Adjustments ..	—	—	—	—	—
Use ..	207,933	231,452	272,191	158,880	178,377
Despatches ..	95	16,589	5,147	960	—
Stock, 31st Dec., 1951 ..	111,255	247,679	74,931	53,161	370

* Used at works for purposes other than sulphuric acid manufacture.

Note.—The above figures include production at Government plants where those plants are producing acid for trade purposes.

CONSUMPTION OF SULPHURIC ACID AND OLEUM,
UNITED KINGDOM

(Year, 1951)	Tons
Trade Uses	100%
Accumulators ..	9,622
Agricultural purposes ..	9,137
Bichromate and chromic acid ..	14,191
Bromine ..	14,503
Clays (Fuller's Earth, etc.) ..	8,862
Copper pickling ..	1,911
Dealers ..	14,259
Dyes and fine chemicals ..	13,048
Dyestuffs and intermediates ..	84,710
Explosives ..	19,807
Export ..	1,610
Glue, gelatine and size ..	473
Hydrochloric acid ..	60,257
Hydrofluoric acid ..	11,186
Iron pickling (including tin plate) ..	88,239
Leather ..	4,713
Metal extraction ..	1,876
Oil refining and petroleum products ..	67,329
Oils (vegetable) ..	9,017
Paint and lithopone ..	131,215
Paper, etc. ..	3,617
Phosphates (industrial) ..	2,585
Plastics, not otherwise classified ..	22,518
Rayon and transparent paper ..	211,811
Sewage ..	10,497
Soap and glycerine ..	13,922
Sugar refining ..	544
Sulphate of ammonia ..	266,464
Sulphates of copper, nickel, etc. ..	20,016
Sulphate of magnesium ..	4,992
Superphosphates ..	358,847
Tar and benzole ..	16,953
Textile uses ..	19,702
Unclassified ..	157,157
Total ..	1,675,590†

† Includes 59,829 tons of imported acid.

Ramsay Memorial Fellowships

THE trustees will consider in June applications for two Ramsay Memorial Fellowships for advanced students of chemistry. The value of each Fellowship will be £400 per annum, to which may be added a grant for expenses not exceeding £100 per annum. The Fellowships will normally be tenable for two years.

The trustees are able to offer these two Fellowships to mark the centenary of the birth of Sir William Ramsay on 2 October, 1852, the necessary funds being provided through the generosity of British Celanese, Ltd., and the ABCM.

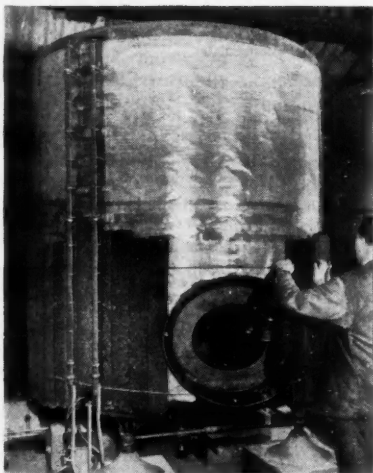
Full particulars can be obtained from the Joint Honorary Secretaries, Ramsay Memorial Fellowships Trust, University College, Gower Street, London, W.C.1.

Heating of Sugar Vats

Problem Overcome by Unusual Means

HOW the difficulty of maintaining the temperature of two large sugar vats was overcome by the ingenious application of soil warming equipment, normally used for agricultural or horticultural purposes, has recently been revealed.

Three years ago, at its Hampshire brewery, Courage & Co., Ltd., was faced



Placing cork lagging over the installation

with the problem of maintaining the temperature of sugar syrup in two 60-barrel capacity tanks at 110°F., with a minimum ambient temperature of 40°F. It was suggested to the General Electric Co., Ltd., that these tanks, which were 5 ft. 6 in. in diameter and 8 ft. high, might be heated by elements from the outside.

This was accomplished by means of 15 s.w.g. galvanised soil heating wire laid on each tank in 12 sections of four turns each. The sections were connected in parallel and fed from a 2.5 kVA soil heating transformer on a 15-volt secondary winding. They were controlled by means of a suitable calibrated long-stemmed thermostat inserted into the liquid near the bottom of the tank.

To support the bus-bars and wire spacers, studs were welded to the exterior of the tank at suitable intervals. The tank was then served overall with a layer of glass fibre cloth impregnated with special shellac 'dope'. wire spacers suitably slotted were placed in position and the wire was wound on. Another layer of glass fibre cloth was then laid overall and the terminations of the windings brought out to the bus-bars held on the studs. Finally, two layers of cork lagging 1½ in. thick were put over the whole installation, and held in position by a sheet metal cover drawn tight by suitable tensioners.

Satisfaction with the apparatus, which has now been in use for two years has been shown by the placing of further orders by Courage & Co., Ltd., for three similar tanks now in course of construction at its London brewery.

On Other Pages

U.K. Sulphuric Acid Returns . . .	261
Packing as Part of Production . . .	263
Italian Chemical Progress in 1951 . . .	265
Exploitation of Methane Gas . . .	267
Swiss Chemical Trade in 1951 . . .	270
Drugs, Fine & Medicinal Chemicals (Part III) . . .	271
Modern Water Testing . . .	274
The Cyclone as a Separating Tool . . .	275

Microchemistry Meeting . . .	278
Rodent Control by Warfarin . . .	279
Chemist's Bookshelf . . .	281
Overseas News Items . . .	283
Home News Items . . .	284
Personal . . .	285
Law and Company News . . .	286
Petrochemicals' Progress . . .	286
Publications and Announcements . . .	287
Next Week's Events . . .	290

The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Packing as Part of the Production Process

Waste of Space and Money for Want of Attention

LACK of appreciation by industry of the importance of packing was emphasised by John E. Evan Cook, joint managing director of Evan Cook's Packers Ltd., and ex-chairman and trustee of the Institute of Packaging, in a talk delivered to the Institute of Production Engineers, South Wales and Monmouthshire Section, at Merthyr Tydfil, on Tuesday, 5 February.

Confusion that was apt to arise between the two words 'packing' and 'packaging', was first clarified by Mr. Cook, who said that the former was generally applied to bulk packing for shipment or transport, while the latter was usually associated with smaller items (such as cans, cartons, bottles and the like), intended for sale over retail counters. His talk would deal with the former, packing for export, particularly of machinery, electrical and scientific equipment in the heavier category—that is to say, too heavy to be handled by one man, and therefore requiring handling equipment and sturdy wooden cases for protection of the contents.

Packing should, as far as possible, be a part or at least a direct continuation of the process of production. A continuous flow was desirable, if it could be achieved, so that the item could emerge fully protected and ready for shipment when the transport department was ready for it. The sooner a product was protected by its pack, the less likely it was to suffer damage in the factory itself, or to be exposed to certain elements which would ultimately lead to deterioration before it was delivered to the consumer.

Packability of a Product

Yet in spite of this, how often did one hear of a packing engineer being consulted as to the packability of a product, or how often did one come across a packing engineer in a plant producing engineering or similar equipment? All too frequently it was left to chance, plus any knowledge the packing shop foreman might possess.

This inattention to packing, and at the earlier stage, the packability of a product, was at present costing industry in Britain vast sums annually in excessively high charges for shipping space, unnecessarily

costly or elaborate packing cases, and damage claims which should never arise.

As with every other product, consideration of the packing problem should enter into account at the design stage of the product itself.

Importance of Early Protection

In theory, it should make no real difference when the packing was done—providing it was done, and done well. In practice, however, many things could happen to unpackaged goods in the factory itself, with serious effect on the goods both in the factory and after they left the works. Early protection was important for the following reasons:—

(1) As a means of avoiding damage and deterioration to the goods while in store or awaiting transport; (2) avoiding unnecessary transport and handling in the works; (3) protection against petty pilferage; (4) a factor in increasing output efficiency; (5) safeguard against causing 'hidden damage' which did not show until the goods reached the buyer.

Length of storage should be given prominent consideration in relation to all other matters, for it was clear that much more could happen in five months than in five days.

Despite the general awareness of the rapidity with which corrosion attacked metals and of the insidious nature of its onslaught it was astonishing how seldom the necessary precautions were taken in advance.

Cleaning, de-greasing and maybe de-rusting were the first step. All too often this was carried out in a slap-dash fashion. Rust inhibitor oils and compounds should be used wherever possible.

Dust and finger prints were extremely corrosive, finger prints being one of the worst enemies of precision instruments which required to be handled many times between production and storage.

No component part, sub-assembly or complete assembled product should go into store until it had been given some form of preservative treatment.

Next came the question of protection

from mechanical damage or breakage during the remainder of the stay in the works. Goods should be packaged as soon as possible after the final inspection. They should never be allowed to go into store unpacked until wanted.

Cheap and Easy System

The speaker then went on to describe in some detail a system which was not difficult or costly to execute if space or layout permitted. He favoured the flow of materials at right angles to the flow of products, the latter entering the packing lines at ground floor level, and the packing materials reaching the same point by overhead feed.

At one end of the building the means of entry for the products to be packed should be arranged, together with a reception sorting and feed marshalling area. From it should be constructed as many roller-conveyor packing lines as were required down the length of the shop to the despatch or transport bay.

Heavy packing required a somewhat different layout, based on the use of overhead lifting tackle. Mr. Cook said that he still adhered, however, to the principle of a 'line' for all packing, and advocated the use of roller conveyors to give mobility even to the heaviest jobs. The overhead materials feed platform might not be possible, but the principle of having all materials near at hand should be stuck to, and there should be proper reception and marshalling areas for incoming products at one end of the shop with storage zones for materials at the sides.

Well ventilated storage space, free from damp of any type was essential for products after packing. Air should be allowed to circulate freely around the packs. The use of pallets or stillages helped, and also made for easier transport, handling and stacking—again off the floor and free from contact with rising damp.

Protective packing should be the subject of periodic high-level conferences attended by top executives including someone with the knowledge and ability to present package engineering. The draughtsman or designer of the product could do a lot, for instance, by eliminating protuberances which took up valuable space. By saving 3 in. on the length of a packing case, a saving was made of £750 per annum through lower freight charges on extensive shipments to Australia.

New consideration might well be given to all-welded structures that could not be dismantled. Many jobs consisted of four legs surrounding 90 per cent of air which was charged for by the shipping company at exactly the same rate as it would be if it contained something useful. This was a high price to pay for shipping legs, which could often be detachable and packed elsewhere in the case at half the shipping price.

Having designed the product properly and planned the packing layout, the next need was to establish the correct type of pack for the product. Here again specific consideration was needed for each product; each must have the pack that did the job for that particular product.

In conclusion, Mr. Cook summarised the main points of his talk in ten 'rules' for packing, which he once again stressed should not be a watertight compartment or a mysterious matter to be left to a foreman packer, but should be studied by production engineers as part of their job.

Cosmetic Chemists' Dinner

THE Society of Cosmetic Chemists of Great Britain held a dinner on 1 February at the Mirabelle Restaurant, Curzon Street, London. The guests of the Society were Mr. W. A. Poucher, the well-known perfumer and author, and Mr. C. A. Williams, secretary of The Toilet Preparations and Perfumery Manufacturers' Federation of Great Britain.

The dinner was extremely well attended by chemists from most of the leading cosmetic houses and by their guests—the latter including some of the leading personalities in the perfumery industry.

The chairman of the Society proposed the toast of the guests and Mr. Poucher replied in characteristic vein.

Fine Chemicals Group

Owing to the death of H.M. the King, King's College was closed on Friday, 15 February, and the meeting of the Fine Chemicals Group of the SCI arranged on that day has been postponed until Friday, 22 February. It will be held at 7 p.m. at The Chemistry Lecture Theatre, King's College, Strand, W.C.2

Italian Chemical Progress in 1951

Improved Output and Increased Demand

INTENSIFIED activity, caused both by demand in the home markets and by overseas purchases for reserve stocks, marked the first quarter of 1951. In April, however, there was a return to more normal conditions.

A slight decline in output occurred in factories producing artificial fibres and in establishments engaged in tanning, but, generally speaking, the year was satisfactory, the total production of Italian chemical industries in 1951 exceeding that of 1950 by 38 per cent.

Output of sulphuric acid increased by about 18 per cent, principally due to the increased activity of manufacturers of superphosphates, iron and steel works, and of various branches of chemical industry.

A substantial increase was registered in the consumption of nitrogen fertilisers, which rose by about 30 per cent from 120,000 tons recorded during the 1949-50 season to 155,000 tons. Some 285,000 tons of phosphatic fertilisers were consumed, an increase of about 11 per cent.

Outputs of calcium carbide, calcium cyanide, synthetic derivatives of acetylene, sodium carbonate and caustic soda were all marked by considerable improvement.

Sodium products had an excellent market during the first half of the year when the glass industry and producers of artificial textiles were particularly busy. During the latter part, however, the demand declined.

Caustic Consumption Increased

Electrolytic caustic soda enjoyed heavy demand during the first six months, but later on the demand from rayon and cotton industry diminished and that from tanning industry practically stopped. This was counteracted to a certain extent by increased demand from the petroleum industry, paper mills, and by exports. It can therefore be considered that consumption of this product exceeded by about 20 per cent that of the previous year.

Both output and consumption of chlorine increased by about 30 per cent. Further developments were expected as a result of the increasing requirements of producers of chlorovinyl resins. Owing to good demand from producers of tartaric acid and

from metallurgic industry, the output of hydrochloric acid exceeded considerably the figures of 1950.

In spite of the fact that plants producing hypochlorite worked only to the extent of one third of their capacity, the quantity produced exceeded actual requirements for the chemical.

Carbon bisulphide scored an increase of about 40 per cent and practically the whole output was absorbed by the home market. There have been practically no exports of this product owing to the high cost of raw materials required (sulphur, coke and charcoal) and the resulting high prices of the product.

Production of Derivatives

Considerable problems had to be encountered in the production of derivatives from the distillation of coal and tar. Supplies of coal from Germany were gradually diminished, while shortage of shipping and the consequent high freights affected deliveries from America. By-products of cokeries, such as benzole and its derivatives, were easily marketable in the country, but lack of demand for tar oil and pitch led to the export of the commodities at low prices.

Dyestuffs and intermediate materials did reasonably well. Improvement in this branch which began late in 1950 continued well into the first months of 1951 but later slackened down. Nevertheless, a slight increase in output was reported compared with 1950. During the first half of 1951 imports of dyestuffs increased by about 50 per cent over the previous year. This has led to complaints from Italian manufacturers who consider the imports excessive. There was, however, also a considerable increase in exports.

Factories engaged in the production of starch, glucose, and dextrin, were kept busily employed. Marketing of glucose was quite easy, but the demand for starch was weaker.

A good production record was achieved by the pharmaceutical industry, but for some medicines, such as those extracted from animal organisms or exotic plants, imports still had to be relied on. There has been a considerable increase both in output and

demand for vitamins, some sulphanilamides, antihistaminics, all antibiotics and hormones.

During the year another large factory for manufacture of penicillin and streptomycin started operating in Rome, and thus enough streptomycin for home requirements is now made in Italy, while the output of penicillin has exceeded the needs of the country.

Almost all pharmaceutical factories have been enlarging and modernising their plants while several new ones are also being built. Some companies in Northern Italy are also tending to build factories in the south. A considerable amount of exporting was carried out in serums, vaccines and organic arsenic compounds. Good exports were made also of chloramphenicol, folic acid, and salts of *para*-amino-salicylic acid.

Patent Medicines Sale

Recently there has been a movement in Italian Government circles in favour of reforming the legislation concerning the manufacture and sale of patent medicines and medicines in general. It is generally agreed that the existing legislation must be brought up-to-date but it is realised that the matter requires very careful consideration as mistakes in this field might damage the pharmaceutical industry of the country.

No improvement was shown in the output of sulphur which was some 10 per cent below the 1950 figure. In spite of measures recently taken (financing of sulphur mines and a grant of 950 million lire for research) it does not seem likely that any benefit will be derived for some time. Production of pyrites reached some 900,000 tons which was about the same as in 1950.

Aluminium Output

Output of aluminium reached approximately 4,200 tons a month, an improvement of some 25 per cent over 1950, and approaching the peak figure of 1941. Zinc production beat all previous records with a figure of 4,000 tons a month. This considerably exceeds the requirements of the country and useful stocks have been accumulated. So far the Government has been sparing in granting export licences for this metal but there is a good demand from the international market.

Lead output amounted to about 2,700 tons monthly. This is estimated to be all that can be expected, but the quantity is sufficient for home consumption.

I.G. Farben Break-Up

Ludwigshafen Works Taken Over

PART of I.G. Farben has emerged as a powerful independent unit and has taken over the big Farben works at Ludwigshafen under the name of Badische Anilin und Soda Fabrik.

The company has been operating since the war under Allied control, and has flourished in spite of heavy wartime losses. Last year, the Farben combine produced and sold more than £57,000,000 worth of dyes, plastics, fertilisers and heavy chemicals. One-third of this output was exported by a sales organisation which was supposed to have been completely dismantled at the end of the war.

Only 800 workers were still operating the huge Ludwigshafen works at the end of the war. To-day, it employs some 26,000 people, about as many as before the war.

The new company is headed by Hr. Herman Abbs, a leading German financier, and Dr. Richard Kuhn, a chemist who refused the Nobel Prize on Hitler's orders.

The new company will remain under Allied control until the process of liquidating ownership rights in the vast Farben combine is settled. Nine independent concerns are planned to come out of the whole combine.

Two more big combines and six smaller companies are expected to emerge eventually as a result of the Allied programme, started seven years ago, to break up the Farben cartel.

Before the war, I.G. Farben monopolised the German chemical industry and had ties with British, U.S. and other foreign chemical producers. The Allied aim has been to break up the combine.

Dichlorodimethylhydantoin

DICHLORDIMETHYLHYDANTOIN is now being produced on a tonnage basis by the Glyco Products, Co., Inc., at Natrium, West Virginia, U.S.A. It is being sold under the trade-mark, Dantoin.

Dantoin is a fine white powder with an available chlorine content of 66 per cent (minimum). It has a mild hypochlorous odour, melting point of 130°C. and sublimes at 100°C. It is only slightly soluble in water but is soluble in many organic solvents.

Exploitation of Methane Gas

Basic Material for Chemical Synthesis

ADVANTAGES accruing from the extraction of methane gas directly from mines without dilution were discussed by Dr. D. W. Gillings (Central Research Establishment, National Coal Board) in a paper entitled 'The Extraction and Utilisation of Methane from Collieries', which he delivered to the Nottingham Section of the Chemical Engineering Group (SCI), in Nottingham, on Thursday, 7 February.

After a survey of the developments in methane drainage which have taken place during the last few years, the doctor turned to the application of the gas as a fuel or as a basic material for chemical synthesis.

Exploitation of the technique of methane extraction can yield a considerable tonnage of valuable raw material, he explained.

Measurements carried out so far in British and Continental collieries indicate that a reliable yield of methane can be obtained from about four or five active bore holes of a series at any one coal face. On a basis of about 50 to 80 cu. ft. per minute per bore hole, this suggests that a representative colliery working two or three gassy faces might deliver between 600 and 1,000 cu. ft. a minute of methane to a collection range and this volume amounts to 1,000,000 to 1,500,000 cu. ft. of methane or a tonnage of 20 tons daily. This order of yield is sufficient to demand serious consideration of a number of chemical processes that use it as well as for its use as a fuel. With this idea of quantity as a background, the various uses of methane can be enumerated and their commercial possibilities reviewed.

Survey of Uses

Uses can be grouped into those where the methane is primarily required as a fuel, and those where the final product is primarily required for its chemical properties. The fuel uses are: (i) Direct replacement of coal in boilers, generally on colliery sites; (ii) admission directly to industrial gas networks without intermediate processes; (iii) heating coke ovens to release equivalent fuel value as coke-oven gas; (iv) conversion by cracking to a gas of correct calorific value and density to mix with town or industrial gas; and (v) compressed or as a liquid for use on vehicles.

The main chemical uses are as follows: (i) Conversion to acetylene by a number of processes; (ii) chlorination to methyl chloride, and solvents; (iii) reforming for synthesis gas.

Methane can be regarded as a high-grade fuel, being a clean gas of high calorific value, but even so, its value is less as fuel than when subjected to relatively extensive chemical changes to exploit its potential as a raw material.

At present, however, the gas is used only as fuel at firedamp drainage sites and no installations have yet been completed for manufacture of chemical products.

Firing of Boilers

Earliest use of the gas was for the firing of boilers, and this will probably continue to be extensively applied as the first stage of exploiting the output from new firedamp drainage installations. A successful example is the conversion of the Lancashire boilers at the Point of Ayr Colliery. The supply of methane is fully adequate to meet the whole fuel requirements of the colliery and over 10,000 tons of coal are released annually.

It is now contemplated that delivery of methane to industrial gas grids shall be the major use of the gas at Continental installations, particularly those at the Belgian mines.

Heating of coke oven batteries with methane is practised at the Central Coking Plant at Tertre, near Mons, and is technically quite straightforward. The coke ovens in such plants are not integrated with blast furnaces, and are thus designed for rich gas-firing. Methane is burned without pre-heating, regenerators being used only for air heating. This process is thermally efficient, but the high calorific value is not exploited, although this feature is, of course, common to all the processes so far proposed for using methane in existing gas grids.

Storage of methane on vehicles as a liquid has been studied extensively by Egerton and some of the problems which arise have been satisfactorily solved, so that extensive experiments have been possible on the regular running of public service

vehicles. Its use as a fuel on internal combustion locomotives has interesting possibilities.

Valuable properties of the gas as an engine fuel can be more readily exploited in stationary equipment, and the steam boiler and turbine plant at Point of Ayr Colliery will be replaced as plant becomes available with high compression dual fuel engines of much greater efficiency than the steam plant.

Chemical Processes Uses

When turning to the use of methane in chemical processes it must be remembered at the outset that it is not by its very nature a material of widespread application unless substantially altered at early stages of chemical reaction. It is the lowest member of the paraffin series, and is as comparatively inert as the name of that series implies. Practical experience extending over many years bears out the importance of this peculiar chemical inactivity.

Methane has been available for years now from gas separation plants at some Continental coke ovens, from sewage treatment plants and as natural gas from oil-fields, but only in the last instance has any great chemical industry developed around such supplies. This is, however, only an indication of relative trends in the exploitation of numbers of possible chemical fields and the time may well have arrived to expect more intensive developments.

The actual processes in which methane assumes importance as a raw material can be dealt with broadly as those leading to acetylene as a first stage, the processes for direct chlorination, and the extensions of the re-forming process to the production of synthesis gas for reconversion by the Fischer-Tropsch process.

Acetylene synthesis is carried out in a number of ways differing considerably in detail and operation, all but one having the common feature of subjecting methane to a high temperature, in excess of 1500° C. for a very short reaction period, followed by very rapid cooling to stabilise the equilibrium so attained.

(a) Arc Cracking

In the arc cracking process, a gas mixture of unchanged and partially processed methane is passed through an arc, on which direct thermal cracking takes place, a large percentage of hydrogen being formed directly from the methane, together with the

acetylene, some ethylene, high paraffins and carbon black.

(b) Partial Combustion

The basic chemical change can be brought about by an alternative method of high temperature heating, and can be expressed, with great simplification as



This reaction absorbs heat, the value of ΔH_{298} being + 90 k. cal. The heat is provided at the necessary high temperature by combustion of a small proportion of the methane with pre-heated pure oxygen. If the temperature is maintained at ca. 1,500° C., about 8 per cent v/v of acetylene is produced; in the pilot plant trials the actual burner mechanism gave trouble and the problem called for intensive study of methods of combustion which ensured good mixing and complete burning. Hydrogen in large quantities, and an appreciable tonnage of carbon black are also valuable by-products of the reactions.

New Process Described

A new process operating on essentially similar principles has recently been described, in which the combustion of part of the methane and heating and cracking of the remainder are carried out almost together, the gases being separated only by control of the direction of flow.

(c) Regenerative Cracking

In this rather similar process, reaction vessels are lined with masses of aluminium oxide, and are alternately heated by burning methane and used as reaction vessels at reduced pressure. Carbon is deposited on the alumina, during the reaction, and is burned off during the heating stage. Neither of the last two processes have been worked on the large scale, but it is believed that the regenerative process could be operated economically. The regenerative cracking process has also been modified so that the effective partial pressure of the gas during the cracking process is not reduced by reducing the overall pressure but steam is admitted to dilute the gas. The operating temperature is significantly lower, resulting in a less complete conversion to acetylene, with some formation of ethylene.

(d) Glow Discharge Process

All the preceding methods of carrying out the conversion are dependent on an elevated temperature, but there is a further process in which the methane is subjected

to a glow discharge, on which experimental work was still continuing recently. The pressure of gas, form and dimensions of electrodes and current consumption are controlled to maintain only a glow discharge at a temperature less than 150°. Conversion to acetylene is as effective as in the other processes and the lower temperature helps to maintain energy efficiency.

Chlorination of Methane

A number of processes have been operated on a varying scale of production to obtain the chlorinated methanes directly from the gas. Carbon tetrachloride is obtained by burning methane directly at 500° C. or above. In one process operated at Huls in Germany, chlorine is reacted at methane in two stages to produce mainly carbon tetrachloride with some perchloroethylene. At Höchst a larger scale plant was operated with a main reaction vessel packed with porcelain to promote the chlorination and a temperature limited to 400° C.

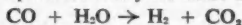
Under these conditions, there is a high yield of approximately equal fractions of methyl chloride and methylene dichloride. A smaller yield of chloroform is also obtained, and the mixture of chlorides distilled in a high efficiency column to give individual components of more than 99 per cent purity, with a mixed solvent residue. Methylene dichloride can also be produced by chlorination with metal chlorides as catalysts.

Re-Forming Processes

The re-forming processes by which methane is converted to carbon monoxide and hydrogen mixtures has been mentioned as one of the methods of fuel utilisation. The methane/steam reaction will by itself yield a synthesis gas.



This reaction can be carried out in a reactor maintained at 870° C. with a promoted nickel catalyst, and further reaction at a lower temperature will yield more hydrogen.



Alternatively, partial combustion in the presence of a nickel catalyst at 800° - 1000° C. can yield mixtures of CO-H₂, thus:—



This synthesis gas is then treated by the Fischer-Tropsch process, reacting at 200° - 300° C. in the presence of cobalt or iron

catalysts, to yield mainly hydrocarbons and carboxy derivatives used for manufacture of a wide range of materials. High pressure oxidation of methane in two stages with differing catalysts will yield methanol. Use of nitrogen oxides as catalyst yields a mixture of methyl alcohol, formaldehyde and formic acid.

Important Starting Material

Acetylene is a most important and versatile starting material for chemical synthesis, and only a few examples of interesting derivatives can be given. A most important use is the production of polyvinyl plastics, both of the acetate and chloride group for which there are a great number of uses to-day. Reaction with water in the presence of a mercury catalyst will give acetaldehyde, itself an important starting material for synthetic rubber and a variety of other compounds as well as being valuable in itself.

Valuable solvents can readily be produced by chlorination of acetylene. Acetone, of wide use as a solvent and as a material for further synthesis can be obtained by catalytic hydration. Besides these numberless products ultimately obtainable from acetylene, hydrogen cyanide and carbon disulphide can be readily prepared from methane.

Enough has been said of the use of methane for chemical manufacture to indicate the widespread potential use. It should, however, be remembered that many of the processes described as technically successful depend on the availability of large tonnages of methane.

Since the output for most pits is restricted it might become essential to group a number of pits for firedamp drainage operations. By this means the increased realisation for the gas can be most readily assured, and it is probably to such grouping of pits as this that the industry will look for provision of large tonnages of methane for the profitable realisation which may some day supersede the purely fuel applications so far.

Dr. Gillings concluded by expressing his thanks to the Director-General, Scientific Department, National Coal Board for permission to publish the paper and by gratefully acknowledging the assistance of his colleagues of the North-Western and Northern (N. & C.) Divisions, N.C.B.

Swiss Chemical Trade in 1951

Favourable Development of Exports

CHEMICAL manufacturers in Switzerland were last year confronted with unusually difficult conditions in the way of shortage of important basic supplies, the high level of raw material prices, and competition from a recovering Germany.

That these problems were successfully tackled is shown by the official trade statistics. Chemical exports rose from Swiss Fr. 583,320,000 in 1950 to Fr. 808,687,000 in 1951.

Principal Exports

Principal chemical export groups continued to be pharmaceutical products and dyestuffs. Value of the former (in Swiss francs) advanced to 291,800,000 (225,451,000), and those of coal-tar dyes and indigo to 276,412,000 (221,782,000) to which must be added 12,279,000 (11,895,000) for coal-tar derivatives, aniline and aniline compounds.

Other important chemical exports were explosives and ammunition which accounted for Swiss Fr. 45,924,000 (13,725,000), perfumery and cosmetics with 43,945,000 (28,708,000), paints and lacquers 12,454,000 (8,386,000) and plastic materials 11,835,000 (5,154,000). Chemical raw materials and industrial chemicals were nearly doubled according to the Swiss export returns with a value of Swiss F. 101,068,000 as against 54,166,000 in the previous year.

Although the Swiss dyestuffs industry has had to surrender to Germany the position of the largest exporter of dyes in the world which it temporarily occupied in 1950, exports developed favourably in many directions despite the drawback imposed by the strength of the Swiss franc and the consequent desire of other countries to economise on imports from Switzerland. Exports of drugs and pharmaceutical products have now overtaken those of dyestuffs and intermediates due largely to special advances in the field of new preparations.

Swiss chemical firms also devoted much attention last year to bringing out new synthetic washing agents, chemical fibres, and materials for the building and textile trades. These did not, however, play an important part in exports, being for the most part sold in the home market. The sharp increase in

exports of ammunition was noteworthy.

The strength of the Swiss franc was of advantage in the import trade because it enabled Swiss manufacturers to secure the basic materials on which their operations depend. The increase in chemical imports from Swiss Fr. 239,163,000 in 1950 to Fr. 414,378,000 last year was to some extent due to higher prices, but there was probably some further accumulation of stocks by Swiss manufacturers in addition to the increase in purchases necessitated by larger consumption for home and export manufacture.

Drugs and pharmaceutical products accounted for imports to the value of Swiss Fr. 94,715,000 (52,477,000), coal-tar dyes and indigo for 14,207,000 (8,118,000), paints and lacquers 32,132,000 (20,890,000) and plastics for 12,669,000 (6,988,000). Imports of coal-tar derivatives and aniline amounted to Swiss Fr. 20,301,000 (9,138,000), aniline compounds to 17,552,000 (7,053,000), while chemical raw materials and industrial chemicals not elsewhere specified rose to 199,912,000 (114,917,000).

Import restrictions imposed by a number of European countries cannot but impair the exports of finished chemical products from Switzerland, especially drugs and toilet preparations. On the other hand, the leading chemical companies in Switzerland regard the existence of marketing and manufacturing subsidiaries in important foreign countries as an important asset for their own export trade. Active business relations with the expanding German chemical industry are expected to facilitate provision of scarce basic materials. Although chemical imports rose by a higher percentage last year than exports, the margin of exports over imports did in fact increase in 1951.

Systemic Insecticides Antidote

Research at the University of Chicago has established that the alkaloid atropine is an effective antidote for accidental poisoning from systemic insecticides such as parathion, TEPP, and so forth. These destroy cholinesterase in the body, an enzyme vital in the choline/acetylcholine system that controls muscle contraction.

Drugs, Fine & Medicinal Chemicals During 1951*

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

IN the field of analgesics a most excellent and well documented review, by Weill and Weiss, of the chemistry of the totally or partially synthetic analgesics with action equivalent to that of morphine is to be found in *The Bulletin of Narcotics*, 1951, 3 (2), 12, issued by the World Health Organisation.

The most recent commercial development in the field has been the admission of Metopon hydrochloride to New and Non-Official Remedies, and it can surely be only a question of time before this valuable and expensive drug receives full pharmacopeial status. Metopon, which is 7-methylidihydromorphinone hydrochloride is obtained synthetically from the naturally occurring opium alkaloid, thebaine, the availability of which alone would set a limit to Metopon production by present methods of synthesis. Side reactions associated with morphine are much diminished in Metapen and dependence and tolerance develop less rapidly. For the time being, Metopon is recommended, for use only where most needed, namely, for the control of pain in cancer when the disease approaches its lethal termination.

Chalrier *et al.* (*C.R. Acad. Sc.*, Paris, 1950, 231, 289) have studied morpholyl derivatives of opium alkaloids and their derivatives.

Effects on Visceral Pain

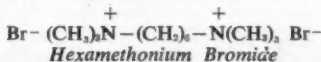
Gaensler (*J. Clin. Invest.*, 1951, 30, 406) has investigated the analgesic effect of a range of analgesic drugs on visceral pain. It is well known that techniques of pain measurement involving induction of cutaneous pain are not applicable to the visceral pain, where a mechanism involving distension is the stimulus. Gaensler used a method by which the bile duct in man was distended by water pressure and the subjects were patients who had had operations on the biliary tract. Pain thresholds and the character of the pain were found to be remarkably constant from patient to patient. Morphine and pethidine produced an appreciable rise in the pain threshold in the conditions of the test within 7 to 15 minutes and a peak rise in 30 minutes after injection. Codeine, dihydromorphinone and amidone each gave

a peak rise after 60 minutes. Oral aspirin and the injection of placebo solutions gave negative results so far as the raising of the visceral pain threshold was concerned.

Methonium Compounds

The methonium compounds have been the subject of wide clinical appraisals during the past twelve months. These developments commenced with the isolation of *d*-tubocurarine by King, in 1935, and its introduction to medicine in the mid-forties. *d*-Tubocurarine is the active principle of curare, the South American arrow poison. The action of curare is that of *d*-tubocurarine, which paralyses the musculature. The active principle was first used for modifying convulsions in therapeutically induced convulsions. Subsequently, it was introduced as an adjunct in anaesthesia and thereby exerted a revolutionary change in surgical procedures. The drug is especially valuable in developing the full muscular relaxation which is so desirable in abdominal surgery.

The introduction of *d*-tubocurarine led to the development of a whole group of synthetic muscle relaxants. The first attempts to reproduce the pharmacodynamic nucleus of *d*-tubocurarine led to the synthesis of straight-chain structures with a substituted quaternary nitrogen at each end. Members of this, the methonium series, with five, six or ten carbon atoms in the chain have become established in medicine. Their importance resides partially in the fact that they exert a diminished action on the respiratory muscles as compared with *d*-tubocurarine in which the margin between muscular relaxation and respiratory paralysis is small.



It has been found subsequently that the methonium compounds act through a mechanism which is dissimilar from *d*-tubocurarine and the curariform muscle relaxants. It has been known since the pioneer work of Dale in 1915 that the stimulus for

* Continued from our issues of 12 January, pp 101-108 and 9 February, pp. 233-238.

muscle contraction normally involves the release of acetylcholine at the nerve-muscle junction or synapse, and that, after exciting the muscle the acetylcholine is rapidly destroyed.

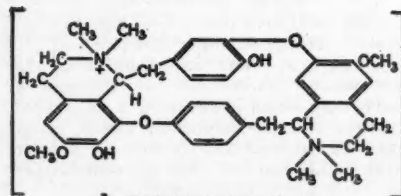
It is in relation to the acetylcholine formed that the action of the curariform muscle relaxants is to be differentiated from the depolarising agents of the methonium type. Curare intervenes to prevent the excitation of muscle by acetylcholine; but the methonium compounds act at the nerve ends just like acetylcholine except that, unlike acetylcholine, they are not rapidly destroyed. Consequently, the excitatory action of the methonium compounds persists to the point at which the muscle becomes paralysed.

Shorter Carbon Chains

Methonium compounds with the shorter carbon chains have a specific action on the autonomic nervous system which controls the involuntary muscle movements. High blood pressure and peptic ulcer are considered to be manifestations of abnormalities of the autonomic nervous system and hexamethonium has been found to be of value in the treatment thereof. Drugs of this class are also being investigated in the treatment of peripheral vascular disease and 'hiccup' which might have proved resistant to other forms of treatment.

Murphy (*Lancet*, 1951, ii, 899) reports most encouraging results in the treatment of hypertension (high blood pressure) of different degrees, while Mackay and Shaw (*Brit. Med. J.*, 1951 (4726), 259) cautiously observe that methonium compounds offer a useful method of control of hypertension.

Huther and Pascoe (*Br. J. Pharmacol. and Chemotherap.*, 1951, 6 (4), 691) show that there is an inverse relationship between the two groups of neuromuscular blocking agents, because they find that, in suitable dosage, decamethonium restores neuromuscular transmission after block by *d*-tubocurarine in experimental animals.



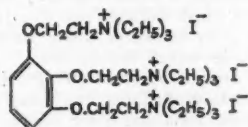
d-TUBOCURARINE CHLORIDE

Scurr (*Brit. Med. J.*, 1951 (4735), 831) has investigated a depolarising agent related to succinyl choline (first reported by Bovet in 1949) namely, di-(β -ethyl-dimethyl-ammonium-ethyl) succinate diiodide, and expresses the view that it may be too short-acting for surgeons' requirements, but may be useful in attenuating electric convulsion therapy.

Wien and Mason (*Br. J. Pharmacol. and Chemotherap.*, 1951, 6 (4), 611) have investigated a series of homologues of hexamethonium in which one or more methyl groups of each nitrogen atom are replaced by ethyl groups. The authors stress the importance of the distance between the terminal quaternary nitrogen atoms and the importance of the type of terminal groupings in regard to the structure/action relationship with optimum activity. The bis-ethyl-dimethyl-ammonium homologue (hexane-1:6-bis-ethyl-dimethylammonium bromide dihydrate) was found to be one and a half times as potent as hexamethonium in blocking nerve/muscle transmissions.

Important Muscle Relaxant

Gallamine triethiodide is an important muscle relaxant with curare-like action. It is 1,2,3-tri-(β -diethylaminoethoxy) benzene triethiodide, and was first studied by Bovet in 1947.



Doughty and Wyll (*Proc. Roy. Soc. Med.*, 1951, 44, 375) offer an assessment of this drug and conclude that it offers the clinical advantage of a greater margin between muscular relaxation and respiratory paralysis, an equally effective but shorter period of action, absence of blood-pressure lowering effect and an action more readily reversed by neostigmine.

Another drug which has become accepted as a muscle relaxant, with especial benefits in the relief of tremors such as occur in Parkinson's Disease ('The Shaking Palsy' first studied by James Parkinson in 1817)—is 3-*o*-toloxy-1:2-propanediol which was developed from a study of glycerol ethers by Berger and Bradley in 1947. This drug, however, is one of a variety of agents of differing chemical structure which possess in varying degree the property of acting as a

'blocking agent', which action is modified by other side-effects which may not be desirable, but which may, on the other hand, be of benefit, according to particular circumstances.

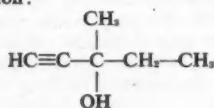
N-(2-diethylamino-*n*-propyl) phenathiazine is another drug of the type introduced by Bovet in 1950. Other drugs which are neuromuscular blocking agents at differing levels and are especially of benefit in Parkinson's Disease are 3-(*N*-piperidyl)-1-phenyl-1-cyclohexyl-1-propanol, certain of the antihistaminic drugs and structurally related compounds, and certain of the solanaceous alkaloids. The chemistry of this miscellaneous group of compounds has been comprehensively summarised by Burtner in a new book published in 1951 ('Medicinal Chemistry', Volume 1; Editor: C. M. Suter; Chapman & Hall, Ltd.).

The most recent introduction in this class of drug has been *dl*-1-cyclohexyl-1-phenyl-3-pyrrolidino-propan-1-ol. It is understood to be of British manufacture and to be available under the brand name of 'Kemadrin'. Clinical trials of the drug are still in progress; but so far as they have gone the drug is indicated to be one of considerable promise in the field.

Treatment of Epilepsies

Phenylacetylurea, first reported as a muscle relaxant by Bovet in 1949 has been admitted to New and Non-Official Remedies (*J. Amer. Med. Ass.*, 1951, 147 (1), 60). It is useful in the treatment of certain epilepsies and its action has been summarised by Tyler and King (*J. Amer. Med. Ass.*, 1951, 147 (1), 17). It has been claimed to have remarkable anticonvulsant activity. It controls and reduces the frequency of seizure and has been found effective where other drugs have failed. It must be used very cautiously because of the risk of induced personality changes, liver damage and blood dyscrasias.

Margolin (*Science*, 1951, 114, 384) has reported a new class of hypnotics—unsaturated carbinols. The simple unsaturated aliphatic carbinols were found to have a high activity, a desirable duration of action and low toxicity. 3-Methyl-pentyne-3-ol was considered worthy of a thorough clinical investigation:



Its action was found to be highly selective, and analgesic, anaesthetic and antispasmodic actions were found to be absent. By contrast with barbiturates, high dosage did not cause respiratory depression. Parenteral caffeine caused rapid recovery from the deep hypnosis induced by overdosage. Toxicity in animals was found to be notably low even in doses 70 times those recommended for human beings.

Glaser and Hervey (*Lancet*, 1951, *ii*, 749) have studied the relative efficiencies of hyoscine, benadryl and phenergan in the prevention of sea-sickness, using controlled cross-over experiments with statistical tests for significance.

Protection from Vomiting

Protection from vomiting in those who might otherwise have vomited was as follows:—Hyoscine, 96 per cent; phenergan, 61 per cent; benadryl, 44 per cent. If nausea and vomiting are considered together the percentage protection was:—Hyoscine, 77 per cent; phenergan, 65 per cent; benadryl, 30 per cent.

Ross (*Lancet*, 1951, *ii*, 62) describes a rapid method for estimating efficacy of antihistaminics which obviates tests on patients which are subject to patient and disease variabilities. An earlier worker (Bain) gave a basis for the assessment of potencies of antihistaminic drugs by using a histamine-induced cutaneous reaction; but this technique can be shown to yield considerable experimental errors. Ross now uses the erythema caused by the exposure of human skin to artificial and natural sunlight which has long been known to be due to the liberation of autogenous histamine in the skin. The extent to which the erythema threshold may be raised at different exposures enables an assessment to be made of the potency of administered antihistaminics.

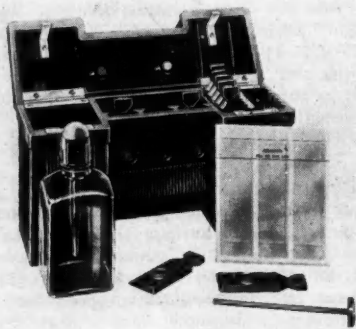
It will have become appreciated that 1951 has been a year of steady development and consolidation rather than one productive of any dramatic new development in the pharmaceutical and medicinal chemical world. The exception may prove to be the discovery of the proguanil metabolite as an antimalarial agent and developments in this connection will be watched with great interest.

(The End)

Modern Water Testing

Chlorine Determination Equipment

IN order to obtain satisfactory results with water treatment plant some simple, rapid and accurate tests must be available for the plant attendants. Such frequent routine tests are essential for enabling the operator to make adjustments according to the variation of the water. Tests of this description should be quite independent of regular physical, chemical and bacteriological examinations carried out by competent qualified analysts, and it is not intended that the testing equipment herein described should replace the more complete analyses.



Various forms of testing apparatus are produced by the Paterson Engineering Co., Ltd., of Windsor House, Kingsway, London, specialists in the field of water purification for over 50 years, and tests can be carried out rapidly and accurately, say the company, by anyone of average intelligence without any previous chemical knowledge.

One of the company's instruments is the Paterson 'Chloroscope', a striking example of plastic work, specially designed for those in charge of chlorine treatment apparatus, for the purpose of enabling rapid and accurate determination of the amount of free chlorine to be made.

The method used is the colorimetric one in which permanent non-fading colour standards are compared with a sample of water under examination to which has been added a measured quantity of the reagent, producing colour proportionate to the amount

of chlorine present. This reagent is supplied with the apparatus.

Briefly the 'Chloroscope' consists of a plastic moulding having the necessary compartments and observation windows, with colour slides of differing design for horizontal viewing and vertical viewing, arranged in two rows facing the operator, and banked for convenient selection.

The equipment also includes a 3-cell sampling unit, constructed of 'Perspex', giving horizontal viewing through 22 mm. and vertical viewing through a depth of 66 mm. A black line is marked to indicate the filling level, and the colour standards are circular coloured discs mounted in moulded plastic slides of convenient shape, each engraved with the colour value in parts per million of chlorine in the water.

This 3-cell unit is filled with water to be tested and the test solution (*o*-tolidine) added in the normal manner, when the organic matter present in the water will absorb part of the chlorine. In practice it is found that if about 0.2 parts per million of free chlorine are present in a filtered and chlorinated water 10 minutes after the action of the chlorine, then the results of a bacteriological examination will be satisfactory. The figure of 0.2 may vary with different waters, but it can be taken as a useful indication.

The swimming bath type 'Chloroscope' gives immediate indication of the correctness of the reagent doses and the chlorine application, enabling the purification plant to be worked under optimum conditions at all times. As usual the free chlorine test depends on the use of *o*-tolidine, which gives a yellow colour.

Cancer Inhibitor Claimed

The development of a non-narcotic preparation for arresting growth and relieving pain in cancer cases is claimed by the Sonorol Products Corporation of the U.S.A. It is called 'Aminosulph', and is said to contain hydrogenated, sulphonated amino-acids. It had been used in 1941, but was found to be unstable. Research has since found a means of stabilising it, say the corporation. Its effect is to make patients feel stronger and gain in weight. The effectiveness of the treatment is determined by the decrease in the amount of drug needed to relieve pain.

The Cyclone as a Separating Tool

Its Use in Mineral Dressing

SEPARATING action of a conical cyclone when filled with a liquid or a suspension of fine particles in a liquid, moving under pressure, was the subject of a paper by K. A. Fern, B.Sc., A.M.I.M.M., presented to the Institution of Chemical Engineers at their meeting on 12 February. The following is an abstract of the paper:—

The first published reference to the use of cyclones for separating minerals suspended in water was made by the late M. G. Driessen, at one of the Dutch State Mines coal-washing plants. This plant included a washer using a loess suspension in water as the separating medium, and cyclones were developed to thicken the dilute suspension washed from the coal, so that it could be returned to the separating vessel. In the operation of these cyclones, it was noticed that the fine coal in the 'washings' was also present in the cyclone overflow. These observations were followed up in further research work, but the war of 1939-45 interfered both with the work and with the publication of results.

However, in 1945 Driessen read a paper before the Institute of Fuel¹ in which he set out very clearly the work which had been done. In this paper he discussed the behaviour of bodies falling in a viscous liquid or fluid, described the development of the cyclone as a thickener and separator for fine coal, and gave some results which had been obtained in test work.

Experimental Unit Described

In a later paper, presented to the American Institute of Mining and Metallurgical Engineers, Driessen went more deeply into the mathematics of separation in a cyclone.² This was followed in February, 1947, by a further paper by Geer and Yancey,³ who described work done on an experimental cyclone unit at the U.S. Bureau of Mines.

So far, the work done in the field of mineral separation had been limited to the cleaning of coal, but during 1947 an experimental unit was set up in the Stamford (U.S.) Research Laboratories of the American Cyanamid Company, and this unit has during the last four years been used to test a wide range of minerals, as well as to

study the fundamentals of the separation. As a result of this work, and that done in the laboratories of the Dutch State Mines, it has been possible to formulate certain principles of operation and to indicate the variables which affect the separation. It has been found that once the optimum operating factors have been selected for any one specific problem, the cyclone separator will not normally require any further adjustments to meet changes in the rate or type of feed, other than to maintain the proper specific gravity of the suspension in use.

Variables Investigated

The principal variables which have been investigated are:

1. Diameter of Cyclone.
2. Included angle of conical section of cyclone.
3. Feed inlet diameter.
4. Vortex or float outlet diameter.
5. Apex or sink outlet diameter.
6. Specific gravity of the mixture of medium, water, and solids to be separated which is fed to the cyclone referred to as 'feed gravity'.
7. Pressure at which material is introduced into cyclone.
8. Specific gravity of medium solids.
9. Fineness of medium solids.
10. Tonnage rate.
11. Ratio of material to be separated to fluid medium.
12. Particle size of material to be separated.

The following discussion indicates the general effect of changing one variable, while the other variables are being held constant.

1. The size of the cyclone determines, in part, the size of the material that can be separated. The 3-in. cyclone is limited to a 10-mesh top size, whereas the 6-in. cyclone can treat material as large as $\frac{1}{4}$ in. Fourteen-inch cyclones in Holland have treated feed up to 0.32 in.

2. The included apex angle of a conical section of the cyclone depends mainly on the gravity of separation desired, the fineness of medium used and the specified gravity of the dry medium. Although a cyclone have 20° apex angle conical

section is more efficient as a separator than one with a 60° apex angle conical section, the latter is necessary in many cases. With a given medium more latitude as to separation gravity is possible with the 60° section. This is particularly true when it is desired to effect a low gravity separation with a comparatively coarse medium, or where a separation is desired that approaches the upper physical limits of that possible with given specific gravity of medium solids. In general, work in the pilot plant at Stamford has shown that a lower weight of float is produced when a 20° included angle conical section is used, than with a conical section of 60° included angle. This is also true of a cylindrical section over a 60° cone as compared with a plain 60° cone.

Wide Variations Possible

3. The feed inlet diameter in conjunction with the vortex outlet governs the throughput of the cyclone. The normal ratio of inlet diameter to diameter of cyclone is about 1: 7 to 2: 7. For each size cyclone there is an optimum feed opening, but wide variations may be made from this without materially affecting the efficiency of the separation.

4. The vortex or float outlet diameter is the same or larger than the feed inlet and thus governs the throughput. The normal capacity of a 3-in. cyclone with feed and vortex openings of $\frac{1}{2}$ in. and 10-15 lb./sq. in. feed pressure is about 15 gal./min.; for a 6-in. cyclone with $1\frac{1}{2}$ -in. feed and vortex openings and 20 lb./sq. in. feed pressure is about 60 gal./min. The larger this opening, the greater the specific gravity of the float medium, so that more heavies will appear in the light mineral product; conversely, a small opening decreases the specific gravity of the float medium and tends to place more light material in the apex or sink discharge.

5. The apex or sink outlet diameter is perhaps the most critical of all variables. The diameter of this opening normally has only a minor effect on the volumetric capacity of the cyclone but small changes will materially affect the specific gravity of separation. A larger opening decreases the specific gravity of the separation and a smaller opening increases the specific gravity of separation. As an illustration, by increasing the apex opening from 0.95 in. to 1.0 in. the specific gravity of a coal separation was lowered

from 1.85 to 1.73. The specific gravity of the apex discharge is usually much higher than the specific gravity of separation, and is much higher than the gravity of the air-lift discharge of a static heavy media cone when the same separation is effected. The apex discharge should have a whirling motion.

6. The specific gravity of the mixture of medium, water and solids to be separated, with the apex opening, is the main control of gravity of separation. With magnetite medium on coal, it is possible (and often desirable because of the efficiency of separation and quantity pumped) to feed the cyclone at 0.2 to 0.4 lower specific gravity than the specific gravity of separation desired. This is also true in most instances when magnetite or ferrosilicon or other heavy materials form the medium for separation of ore minerals. Where light-gravity materials such as loess are used on low-gravity separations the most efficient feed gravity approaches the separation gravity.

The higher the specific gravity of the feed, within limits of allowable viscosity, the higher the specific gravity of separation.

7. The pressure at which the material is introduced into the cyclone controls the volume of material introduced into the cyclone through a given feed opening, and thus controls the centrifugal and centripetal forces acting upon the particles. In general, a high pressure, say 30 lb./sq. in., will give a more efficient separation than a lower pressure, say 10 lb./sq. in.

Best Medium

8. The most suitable medium for a given separation is determined by factors such as availability, cost, ease of recovery, etc. For ease of recovery a magnetic medium is desirable. The top limits of specific gravity separations attained with various media are:

Loess or slate tailings	1.6—1.65.
Magnetite	3.0
Ferrosilicon	3.5

These figures are higher than those which can be obtained with similar materials in the comparatively static conditions obtaining in a conventional sink float separator.

9. The factors entering into the selection of the fineness of the medium are principally viscosity of finely ground medium and ore mixtures, crowding of fine ore particles by coarse medium and the specific gravity of separation desired.

In general for a given specific gravity of

separation, a finer medium than that which is employed in a static heavy-media cone is desirable. With magnetic ground to 90-95 per cent through 325 mesh, efficient separations at 1.35 specific gravity in a static cone are possible; however the same medium in a cyclone makes the most efficient separation at 1.6-1.7 specific gravity. Particles coarser than necessary are detrimental because they are thrown almost immediately to the periphery, causing excess wear, and crowd the particles which it is desired to separate thus thickening the apex discharge beyond the limits of good separation.

The coarse particles, while not entering into the separation, must be continually transported with the rest of the medium, and often require the use of the 60° cone instead of the more efficient 20° cone.

10. The tonnage fed to the cyclone has little effect on the operating efficiency until the limit of ratio of separating medium to quantity of material to be separated is approached.

11. In nearly all cases a ratio of 1 volume of material to be separated to 5 or 6 volumes of fluid medium is required. In certain instances where the medium is carefully prepared as regards maximum particle size and overall size distribution for the desired separation, a ratio of 1 to 3 or 3½ may be possible. For the sake of economy the volume of medium handled should always be kept to a minimum.

Particle Size of Material

12. Regarding the particle size of the material to be separated, European investigators have treated coal up to 0.32 in. in a 14 in. diameter cyclone. However, it is believed a top size of about ¼ in. is most feasible on either the 6 or 14 in. sizes, and 10 mesh on the 3 in. cyclone. The cyclone works more efficiently on sized feed, but can do a creditable job down to 40 mesh on coal and slightly finer on some ores. Since there is a classification and thickening effect superimposed on the separation, because of the centrifugal and centripetal forces induced, the coarser particles will be separated at a slightly lower specific gravity than the average separating gravity, while the finer particles tend to be separated at a slightly higher gravity.

The above discussion has included viscosity as an effect of the variables enumerated only. However, viscosity determines

the fineness of the medium to be used and the permissible ratio of medium to material to be separated. Needless to say, a medium with the viscosity of water would be ideal, but is not practicable. The upper limit of permissible viscosity must be determined by an experiment observing the finest of the material particles to be separated.

During the summer of 1950 an experimental unit was set up on the 'Iron Range' in Minnesota, to investigate the use of the cyclone in the concentration of iron ores. The results of this work were so satisfactory that in 1951 a pilot plant was run continuously.

Information Not Yet Available

Unfortunately, the companies operating these plants are not at the moment prepared to release detailed information as to the results obtained, but it was found that 12-in. diameter cyclones with 20° included angles handled without trouble 35-40 tons of feed per hour.

It is not yet possible to assess accurately the cost of a complete cyclone separator unit, including medium reclamation equipment, since all the units now operating, except that at the Dutch State Mines, have been designed for pilot plant work. The author and a colleague in 1949 designed a cyclone washer for cleaning fine coal in S. Africa, and estimated that, on a basis of 40-50 tons of feed per hour, the cost would be in the region of £2,500 per ton/hour capacity. This is higher than a dense medium separator treating coarse material, but for substantial tonnages the unit cost would probably be lower.

Since the problem of mineral concentration in the cyclone is still in the development stage, this paper has been of necessity somewhat elementary in its treatment. It is hoped, though, that it will serve to focus interest on the problem.

The author expressed his indebtedness to Cyanamid Products, Ltd., and to the American Cyanamid Company for permission to publish the above paper.

REFERENCES

- ¹ M. G. Driessen, "The Use of Centrifugal Force for Cleaning Fine Coal," *J. Inst. Fuel*, 67, 327.
- ² M. G. Driessen, "The Use of Hydraulic Cyclones as Thickeners and Washers in Modern Coal Preparation," *A.I.M.E. Tech. Pub.* 2135, August, 1947.
- ³ M. R. Geer and H. F. Yancey, "Preliminary American Tests of a Cyclone Coal Washer," *A.I.M.E. Tech. Pub.* 2136, February, 1947.
- ⁴ — Erikson and — Herkenhoff, "Cyclone Separator May Be Solution for Fire from Ore Problem," *Eng. & Min. J.*, June, 1950.

Microchemistry Meeting

Analysts Discuss Four Papers

AN ordinary meeting of the Society of Public Analysts and Other Analytical Chemists, organised by the Microchemistry Group, was held at 7 p.m., on Wednesday, 6 February, in the Meeting Room of the Chemical Society, Burlington House, Piccadilly, London, W.1. The chair was taken by the president, Dr. J. R. Nichols, C.B.E., F.R.I.C.

The following papers were presented and discussed:—

'Some Applications of the Conway Microdiffusion Technique', by N. Heron, F.R.I.C., Deputy Public Analyst to the City of Liverpool.

Wide Application

The principles of this elegant and precise, but sometimes neglected, technique of analysis were discussed. The method can have wide application in the Public Analyst's laboratory and procedures were given for the determination of alcohol, chloroform, carbon monoxide and of nitrogen in the form of protein, nitrates and so on.

'The Microchemical Determination of Iron in Aluminium Alloys', by W. R. Nall, Bragg Laboratory, Naval Ordnance Inspection Department, Sheffield.

Iron is determined directly in an acetate-buffered solution of aluminium alloy by absorptiometric measurement of the green colour produced with nitroso-R-salt.

'The Microchemical Determination of Vanadium in Steels', by W. R. Nall, Bragg Laboratory, Naval Ordnance Inspection Department, Sheffield.

Vanadium is preferentially oxidised with cold potassium permanganate solution and allowed to react with an acetic acid solution of 3:3'-dimethylnaphthidine. The adsorption of the red colour produced is measured on an absorptiometer.

'The Separation of Carbides from Steel and their Analytical Examination', by R. Pemberton, Brown-Firth Research Laboratories, Sheffield.

A method was described for the electrolytic isolation of the carbides in steels. The assembly and details of the apparatus were shown. A general scheme was given for the subsequent analysis of the carbides.

Chemical Registrations in 1951

CHEMICAL companies registered during 1951, in England and Wales, included one public, and 344 private with a total capital of £2,231,750. Among the companies registered with nominal capital of £100,000 or over were: chemicals, J. F. Marfarlan & Co., Ltd. (private), £125,000, and plastics, Kleenston, Ltd. (private), £100,000.

In the year ended 31 December, 1951, the total number of new companies placed on the register in London was 12,932, a slight reduction of 2.6 per cent from the total figure in 1950.

Only the same number of public companies (26) as in 1950, made their appearance. Their combined capital on registration, however, jumped from £1,226,725 to £23,653,601. This large increase in the amount of capital of both public and private concerns, according to information issued by Jordan & Sons, Ltd. (company registration agents), Chancery Lane, London, W.C.2, was accounted for by the registration of eight 'millionaire' companies, which included two private concerns: British Oxygen Engineering (£2,000,000), and International Paints (£1,150,000).

In 1951 there were 145 registrations of 'Guarantee' companies being societies, institutions and unincorporated bodies established for a wide range of purposes. Some, which are 'Associations Not for Profit' receive a licence from the Board of Trade to dispense with the word 'Limited'. Names of interest included in the list were: Design and Research Centre for the Gold, Silver and Jewellery Industries; Rubber Technical Developments; and the Institute of Metal Finishing incorporating the Electrodepositors Technical Society.

Pollution Laboratory

The Wear and Tees River Board, at Darlington on 1 February, agreed in principle to the provision of a £7,000 laboratory at Darlington for analytical work to combat river pollution. The chairman Mr. Charles U. Peat, in appealing to industrialists and local authorities to assist the board in their task, said: 'We recognise that removal of existing sources of pollution must be a gradual process, requiring the co-operation of all concerned'.

Rodent Control by Warfarin

A New Approach to the Problem of Bait Shyness

THE new American anti-coagulant Warfarin, now being manufactured in the U.K. by Prior Chemicals, Ltd., promises to be the most effective rodenticide yet produced. Many poisons have been tried against vermin, but for various reasons they have had limited success. The main reasons have been the extreme cunning of rats and mice and their great ingenuity, as well as the danger to human beings and domestic animals inherent in the widespread use of strong poisons. Consequently the rat population alone of the U.K. exceeds that of the human population, and the mice population is double. As they destroy ten times more property and food than they eat, as well as disseminating some of the worst diseases of mankind—bubonic plague, endemic typhus fever, some food poisoning and many others—the pestilence caused by them is incalculable. The important properties possessed by Warfarin are that it does not kill immediately, only after repeated absorption for 4-10 days, thus allaying suspicion and bait shyness, and that it leaves no visible sign or physical pain that the rodents can associate with the means of death. Death results in 5-10 days from the first ingestion of the poison, caused by generalised internal haemorrhage, the rodent dying from suffocation caused by lung haemorrhage.

Ideal Poison Requirements

It is essential that only pure Warfarin be used, as otherwise residual odour and taste causes bait shyness. The requirements of an ideal rat and mouse poison are, in a summarised form: no pre-baiting necessary, no bait shyness induced, no physical pain involved, or suspicion by surviving rodents of the cause of death, no odour or taste to the poison, no deterioration, and no building up of any tolerance or aversion to it. It must also be capable of effective use in small quantities and be relatively safe to human beings and other mammals. It must be reasonable in cost and not involve much labour in laying the baits.

Warfarin apparently fulfils all these requirements. As an anti-coagulant it is 20-30 times more powerful than dicoumarol. It was first discovered by Dr. Carl Paul Link

of the Biochemistry Department, University of Wisconsin, U.S.A., and extensive tests soon proved its efficacy as a rodenticide.

The action of Warfarin is to inhibit the formation of prothrombin, hence gradually and gently inducing haemorrhage. The anti-coagulant action readily outstrips the normal corrective action of the Vitamin K mechanism of the rat and mouse when these rodents ingest the drug over a period of 4-10 days. No immunity can be built up against this action. Moreover if a rodent takes insufficient bait and recovers, later ingestion of enough bait will still kill it, i.e., no more is needed to kill a rat or mouse that has already absorbed some bait than one which has not, and no tolerance can be built up.

Ingested Several Times

As the poison must be ingested several times on successive days, (usually at least five times), the feedings, while they need not be on consecutive days, should occur within a ten-day interval with no period longer than 48 hours between feedings. Thus it is important that the rodents can feed freely and that ample quantities of bait be available at all times during the baiting programme.

Since baits may not be accepted when first exposed, from five to fourteen days (or more in the case of mice), may elapse before adequacy of control is attained. As pure Warfarin has no taste or odour and induces no immediate reaction or sickness a sub-lethal dose is never recognised and rodents do not, therefore, develop an aversion to the poison, but may develop, for various reasons, an aversion (but not always) to the food in which the poison is mixed.

After the third day of treatment there is in most instances a marked reduction in bait consumption and damage: up to this time there is no material change in the appearance or activity of the rodents. Internal haemorrhage can first be observed by a parchment-like look of the skin after the third day, and this persists till death. Frequently sub-cutaneous haemorrhage occurs. The animals lack all zest and vigour and plainly suffer from anaemia, exhibiting extreme lassitude.

An interesting observation during recent field trials is worth recording here. So unsuspecting were the stricken rodents that they actually preferred the Warfarin bait, and although mortally affected, they dragged themselves to the exposed bait, and, completely unsuspecting, ate more of it.

Warfarin does not cause massive external haemorrhage. There is a notion that with certain poisons a rodent's body will not decompose or smell. This is erroneous. No poison will avoid this, but with the delayed action of Warfarin the dying rodents, their lungs becoming congested, prefer the open air and so tend to die out of doors.

No Toxicity Reported

4-Hydroxycoumarin derivatives, of which Warfarin is one, have been under study since approximately 1934 and there has not been any report of human toxicity by inhalation, skin absorption, etc. The same holds for Warfarin handled in similar respects for approximately three years to date.

Warfarin, if ingested in a sufficiently high concentration over a continuous period will certainly kill all mammals. In the concentrations used of 0.025 per cent, relatively large quantities, however, would need to be ingested by humans before a severe case of poisoning would occur. As made by Prior Chemicals, Ltd., Warfarin is dyed to a hue totally dissimilar to any food. This dye is only detectable by humans, as all animals are colour blind.

Care in handling the Warfarin concentrate powders or baits is of course needed. Two main precautions should be taken: (a) Oral intake should be avoided. (b) Hands and fingernails should be scrubbed after handling. The ingestion of a single bait or two will not affect a human being mortally. In case of accidental ingestion, vomiting should be induced at once by giving a tablespoonful of salt in a glass of warm water and repeating until the vomit is clear. Call a physician immediately.

The same treatment should be followed as is used in the clinical control of the anti-coagulant drug Dicoumarol—intravenous injections of massive doses of a water-soluble form of Vitamin K (for example Roche's Synkavit or Abbott's Hyquinone) on the first day, followed by oral intake of five thousand units of natural vitamin K daily, until the prothrombin time is restored to

normal. For severe cases of poisoning, blood transfusions (fresh whole blood) should also be given in addition to the above. Vitamin K is present in green leafy vegetables (spinach, cabbage, etc.), tomatoes, liver, particularly hogs liver, certain food oils, hempseed and soya bean, and other natural foods.

The hazard of Warfarin to other mammals is slight, as the poison concentration in rodent baits is so low. Only a concentration of 0.005 per cent of Warfarin is needed for the extermination of the common or brown rat (*Rattus Norvegicus*). Potential hazard may be further reduced by the use of grain or cereal-type baits which are unattractive to most flesh-eating animals. Even at the concentration of 0.025 per cent Warfarin on the dry substance basis (used for ship rats), household pets would have to eat fairly large quantities of poisoned bait before fatal haemorrhage occurred. By giving a dosage of a Vitamin K preparation in a normal diet or including foods naturally rich in Vitamin K in a normal diet the haemorrhagic conditions can usually be corrected if the intake of Warfarin has not been too prolonged. For a dog 50 mg. daily of Roche's Synkavit Vitamin K tablets dissolved in water and added to its normal diet is recommended for the first three days, and half this amount for the remainder of the week. For a cat half this amount is recommended. Secondary poisoning has occurred in a small number of cases of cats and dogs which have been killed by ingesting unusually large numbers of dead rats and mice which were poisoned by Warfarin.

Poultry and sheep have extremely high resistance to Warfarin in the low concentrations used as baits, the former being almost free of hazard. A pig weighing approximately 1 cwt. would have to eat approximately 12-13 lb. of 0.025 per cent Warfarin bait each day, for about five days, to be mortally affected. Experiments are being conducted as to the effect of Warfarin on rabbits, on which observations will be published later.

Technical and Scientific Register

The total number of persons enrolled on the Technical and Scientific Register at 18 December, 1951, was 5,219. This figure included 3,927 registrants who were already in work but desired a change of employment, and 1,292 who were unemployed.

The Chemist's Bookshelf

CHEMISCHE TECHNOLOGIE. Vol. 3, by Drs. Karl Winnacker and Ernst Weingärtner. Carl Hanser Verlag, Munich. 1952. Pp. XXIII + 911. Dm. 79.

The third volume of this series contains the first part of the organic technology (Vol. I and II were reviewed in *THE CHEMICAL AGE*, 65, 1692, pp. 813/4). Certain sections of the book have been contributed by individual specialists in the respective fields and the editors have also assembled from various other sources a large amount of practical information.

The first two chapters deal with coal and lignite. Besides questions of mining, drying and briquetting they discuss the methods of slow burning and coking. Special attention is paid to the gasification of coal and lignite, whereby the production of synthetic gases for the various inorganic and organic processes is specially accentuated. The next chapter on mineral oil covers the obtaining and distillation of the raw oil and much space is devoted to the description of cracking plants as well as to the modern methods of polymerisation, cyclisation and alkylation. The chapter which follows gives a survey of modern developments for the improvement of lubricating oil with selective solvents, followed by a comprehensive chapter on the production of motor fuels under pressure hydration, with detailed description of the high-pressure apparatus.

Four chapters discuss the technology of wood. Starting from the methods of mechanical treatment, conservation and general utilisation, they describe charcoal and wood sugar production by the two most common methods. Then the production of cellulose and paper is described at length with details of equipment and procedure.

A comprehensive section deals with the aliphatic compounds, beginning with the chemistry of acetylene and the large-scale industries proceeding from it, and continuing with the chemistry of olefines and hydro-

carbons originating from mineral oil. A chapter on artificial fibres embraces the classical methods of their manufacture and uses. Technical methods and recent progress are described with special references to the continuous production and spinning techniques. Of great interest is the description of the newer synthetic fibres which are just beginning to be developed.

A comprehensive description of the Fischer-Tropsch synthesis, catalytic processes, regeneration methods, gas purification and contact apparatus is included, and the volume concludes with a full description of the preparatory methods for all the raw materials in question and their industrial uses and applications. It contains many illustrations, tables, charts and bibliographic data and a detailed index.—F.N.

HORMONES—A SURVEY OF THEIR PROPERTIES AND USES. By H. E. Dale, C. W. Emmens, D. H. Hey, T. D. Whittet, etc. London, The Pharmaceutical Press. 1951. Pp. 220. 35s.

In noting that the aim of this book is '—to provide pharmacists, medical practitioners and students with an account of those hormones and endocrine glands which have well defined pharmacological effects and therapeutic applications—', an aim which has undoubtedly been most satisfactorily achieved, it is necessary to emphasise that the text has been so moulded to this end that it does, in many ways, offer an original treatment of a subject which has been richly dealt with in text-books of a more orthodox sort during the past two or three years. A glance at the main chapter headings—Physiology; Chemistry of the Non-Steroid Hormones; Chemistry of the Steroid Hormones; Standardisation; Action and Uses; Pharmacy—coupled with the information that the whole text occupies less than two hundred pages, will immediately suggest that far from being a basic text-book

for students or a work of reference for clinicians, its main value will be that of giving clear, concise accounts of those aspects of the hormone field which are collateral to the reader's main interest. It is, in other words, a most valuable book for the clinician who would like to know something of the chemistry of the hormones; or *mutatis mutandis*, for the chemist who seeks a better insight into modern clinical applications. But neither are likely to regard the section dealing with their main interest as a *locus classicus*, for fuller and better accounts are elsewhere available. This, however, should not detract from the book's value. The exhaustive treatment 'fit for the research laboratory', is usually for that reason an embarrassment to the more practical needs of students and professional men; but a book such as this that bridges gaps in their appreciation of the subject, and moreover does so without too much conceit of bascules and cantilevers, should be assured of its place on the shelves of many whose interest in the hormones is limited professionally to one or two aspects only.

The book is competently written throughout, and if special mention is given to the chapter on 'Standardisation' it is because this particular field of research has usually been documented hitherto in a diffuse way, spattered piecemeal from cover to cover in text-books; the fact that it is here given a chapter to itself will come as a boon to many readers. The bibliographies are excellent throughout, and a final chapter on 'Commercial Preparations' should be of particular value to clinicians and pharmacists.

One important criticism must be allowed: the editing of the volume, for all we are told, was deemed an unnecessary task for which no one was deputed. This can hardly have been so, even having regard to the many repetitions of text from chapter to chapter which more skilful editing could have avoided. The reader however may fairly wish to know who was responsible for integrating the chapters into book form and will probably feel that 'by direction of the Pharmaceutical Society' does not give him all the information to which he is entitled. A similar complaint might be raised against the presentation of the individual contributions also, for it is not a very generous or helpful policy to push all mention of authors into a prefatory note; rather,

they should stand at the head of their chapters together with some indication of their present positions and activities, a need which is normally fully met by an address. This book has its own very real virtues and there is no reason at all for this gaucherie in its public bow.—F.N.M.

Conference on Cereals

'THE Quality of Cereals and their Industrial Uses' will be the subject of a conference organised by the Food and Agriculture Groups of the Society of Chemical Industry to be held in Edinburgh on 8, 9 and 10 May. It is expected that approximately 15 papers will be read.

On the opening day the morning session will begin with an address by the chairman, followed by papers on 'Cereal Agronomy', 'Grain Protection', and 'Factors Affecting the Value of Cereals as a Food'. In the afternoon papers will deal with 'The Agronomic Characteristics of Oat Varieties', 'The Processing of Oils as Influenced by Agronomy', and 'Utilisation of Cereal By-Products'. An informal dinner will be held in the evening.

Three sessions are arranged for the second day when the following papers will be read:

Morning: 'Testing of Seeds for Viability', 'Selection of Barleys for Malting', 'Malting Systems'. Afternoon: 'Malting of Cereals other than Barley', 'Uses of Barley other than Malting'. Evening: 'Biscuit Flours', 'By-products of Wheat and their Nutritive Aspects', 'Rye for Bread-Making'.

Wetting Test for Plating

Cleanliness of metal surfaces before plating with chromium is essential, and the presence of unwettable substances on the surface is responsible for 90 per cent of the peeling that occurs in chromium plating. The presence of these can be detected, according to a test devised by Columbia University, by hanging up the sheet of metal to be plated and spraying it with distilled water from an atomiser placed two feet away. The spray is shut off after 30-45 seconds. If the surface is clean, the water coalesces into a film. If unwettable substances are present droplets of water form beads on the surface. The test is said to be 160 times more sensitive than the most common wetting test now in existence, as well as being far simpler.

OVERSEAS

Cylindrical Carboy in Use

A cylindrical carboy for use in the exports market in the U.S.A. has been introduced by the Seymour & Peck Company. It is said to save 30 per cent in packing space on board ship, and as it is half as heavy as the traditional type also effects savings in freight. A specially constructed plywood drum completely encloses the carboy itself, which makes it safe for both hazardous and non-hazardous liquids.

India's Fertiliser Factory

The Sindri, Bihar, £17,000,000 fertiliser factory which began production in November, 1951, was visited last month by Dr. W. F. Parker, director of Soil and Fertiliser Research in the U.S. Department of Agriculture, who expressed appreciation of the plant's capacity and production methods. The project consists of a power-house for generating power and the supply of processed steam; gas plant; ammonia synthesis plant and the sulphate plant. The gypsum process for production of ammonium sulphate is used to avoid the importation of large quantities of natural sulphur.

Australian R.D.X.

The Australian Government has decided to produce locally the high explosive R.D.X. The Minister for Defence Production (Mr. G. J. Harrison) said recently that a frictional plant would be established at an estimated cost of £A1,108,000. Key portions of the plant have already reached Australia from Great Britain. Ingredients are already being made in Australia.

Corn Radiation Mutations Found

On an experimental farm in Arcadia, California, over 1,000 radiation-induced mutations have been found in a special study of corn by the California Institute of Technology. Dwarfed, twisted and blue-fluorescent varieties have been grown from descendants of atom-bomb-irradiated seeds, and other plant freaks have been grown from seeds irradiated with X-rays and other radiations. These studies are being carried out to give information on heredity and transmitted traits. They also correlate radiation intensity as measured by Geiger counters and the biological effects of that radiation.

High Temperature Alloys

The development of alloys which will resist structural changes at extreme temperatures is to be the subject of experimental work in Australia at the Defence Research Laboratories in Melbourne, Victoria. The work will be carried out by Mr. Geoffrey R. Wilms, a young research student in metallurgy at the University of Melbourne, whose thesis on the subject of structural changes in metal, during plastic deformation, was recently accorded world recognition.

Du Pont's New Photo Film

Five years' research and nearly £500,000 have gone into the development of a new transparent base for photographic film by the Du Pont de Nemours Company. This is a polyester similar to 'Dacron' fibre, and is said to be several times tougher than the present type of base, while retaining its dimensions and properties over a wide range of atmospheric conditions. All types of film are expected to be improved by the new base, which will be very valuable to the cinema and printing industries. Large-scale production awaits the results of evaluation tests being carried out by the film industry and the armed forces.

ACTH to be Made

Australia will shortly commence mass-production of ACTH. Large quantities of the necessary raw materials are produced locally, and a new company has been formed to initiate manufacture in association with Frederiksberg Chemical Laboratories, Ltd., a Danish enterprise. Dr. Arne Ludvigsen, a representative of this company, who was in Melbourne recently, states that local production would greatly reduce costs in Australia.

Canadian Salt

Production of dry common salt in Canada during November, 1951, amounted to 54,204 tons as compared with 49,927 in the corresponding month of 1950, bringing the total for the first 11 months in the year to 475,750 tons against 415,683 a year earlier, the Bureau of Statistics reports. Salt content of brines used and shipped totalled 36,871 tons in November and 412,007 in the 11 months as compared with respective totals of 31,125 tons and 312,896 for 1950.

HOME

Utilisation of Liquid Fuels

A survey of present-day knowledge of liquid fuels, their properties and utilisation will be given by G. F. J. Murray, B.Sc., A.M.Inst.C.E., M.Inst.F., A.M.I.H.V.E., in a series of eight lectures to be given on Tuesday evenings at the Northampton Polytechnic, St John Street, London, E.C.1. The first talk will be on 26 February at 7 p.m., the dates for the remainder of the course being 4 and 25 March, 1, 22 and 29 April, and 13 and 20 May. Fee for the series will be £1.

Powder Drawback

The Treasury have made the Import Duties (Drawback) (No. 2) Order 1952, which increases the rate of drawback of customs duty paid on smokeless propellant powder used in the manufacture of sporting cartridges from 3½d a lb. to 9d. a lb. The drawback previously allowed in respect of cartridge cases used in the manufacture of such cartridges is now obsolete and is discontinued by this Order which came into operation on 8 February, 1952, and has been published as Statutory Instruments 1952, No. 173.

Record Total of Awards

A record total of 167 cash awards, amounting to £1,536 15s., was made during 1951 to employees of the Dunlop Rubber Company. Varying from £1 to £25, they were given under the company's education scheme for successes in a wide range of examinations. Among them were awards made for gaining the Higher National Certificate in Chemistry (£15); the Higher National Certificate in Applied Physics (£15); the National Certificate in Chemistry (£10); and the National Certificate in Applied Physics (£10).

Numbers Increasing

The number of persons employed in the chemical and allied trades in November, 1951, totalled 496,900 according to the industrial analysis of the *Ministry of Labour Gazette* (Vol. LX, No. 1). This was an increase of 1,000 over the previous month. Of this total, general chemicals and dyes accounted for 224,500 of which 170,400 were men and 54,100 women.

Meeting Cancelled

In view of the sudden death of His Majesty The King, Patron of the Royal Society, the ordinary meeting of the Society arranged for 7 February, was cancelled by order of the president.

1952 Summer Tour

The summer tour of the Food and Agricultural Groups of the Society of Chemical Industry will take place this year in Holland, and will include visits to places of industrial, scientific, and general interest in and around Amsterdam and The Hague. The intention is to leave London on Friday evening, 23 May, and arrive back in London on Sunday morning, 1 June. The cost will probably not exceed £35. The honorary organising secretary is B. V. de G. Walden, Albright & Wilson, Ltd., 49 Park Lane, London, W.1.

Unilever Limited

The board of Lever Brothers & Unilever, Ltd., announce that at an extraordinary general meeting of stockholders to be held at 12 o'clock on 27 February at Unilever House, a special resolution will be submitted to change the company's name to Unilever, Ltd. A similar resolution to change the name of the Dutch parent company, to Unilever N.V., will be submitted to an extraordinary general meeting of the shareholders of that company to be held shortly in Rotterdam.

Industrial Accidents

Fatal industrial accidents reported in December, 1951, were marked by a considerable decrease with a total of 99 as against a revised figure of 117 in the previous month, and 116 for December, 1950. Only three deaths were recorded in the chemicals, oils, soaps and allied industries.

Analysts' Annual Meeting

The annual general meeting of the Society of Public Analysts and Other Analytical Chemists will be held at 5 p.m. on Friday, 7 March, 1952, in the Meeting Room of the Chemical Society, Burlington House, Piccadilly, London, W.1. The Bernard Dyer Memorial Lecture will be given by the Hon. Mr. Justice Lloyd-Jacob.

PERSONAL

MR. ALEXANDER JOHNSTONE QUIG, deputy chairman of Imperial Chemical Industries, was married at Hampstead (London) Registry Office on 5 February, to Mrs. Joan Leason. THE CHEMICAL AGE would like to join his many friends in the industry in wishing Mr. Quig and his wife every happiness.

ALD. J. F. C. COLE and his wife, Mrs. Barbara Cole, are to be Huddersfield's new mayor and mayoress. Mr. Cole is managing director of Cole & Wilson, Ltd., colour and chemical merchants, Huddersfield. He has been a member of Huddersfield Council since 1932.

The Minister for Industry and Commerce in the Republic of Ireland has appointed the following members of the chemical industry to be ordinary members of the Council of the Institute for Industrial Research and Standards for a term of five years:—

PROFESSOR WESLEY COCKER, Professor of Chemistry at Trinity College, Dublin; MR. D. D. COYLE, of Messrs. Hygeia, Ltd., of Galway; MR. THOMAS O'KEEFE KINSELLA, of Messrs. E. O'Keefe, Ltd., of Dublin; and MR. JOHN W. PARKES, of Messrs. W. and H. M. Goulding, Ltd., of Dublin.

Members of the Council are appointed for their attainments in scientific research applied to industry or the support which they have given to such research, or for their utility in promoting the adoption of standard specifications in industry.

MR. JABEZ BENNETT, first executive to be appointed from the staff of the Salt Union, Ltd., by I.C.I., Ltd., when the concern was taken over in 1937, has retired after 40 years' service with the two companies. Mr. Bennett, aged 62, was made I.C.I. Salt Division labour manager when the merger took place. His post involved the control of workers at I.C.I. establishments which included Winsford, Stoke (Worcester), and Carrickfergus (Northern Ireland). He joined the Salt Union's staff at Stoke Prior (Worcester) in 1911.

MR. F. G. W. KING, technical director at the Dunlop Research Centre, Birmingham, arrived in Calcutta on 14 February to

advise on technical, research and management questions at the company's giant factory there. While in India Mr. King will study road transport conditions and visit universities, colleges and other centres of technical interest.

Obituary

The death occurred on 3 February in St. Peter's Hospital, Ottershaw, Surrey, of MR. WILLIAM TREVOR BRUCE, founder of W. T. Bruce & Co., Ltd., in his 95th year.

Mr. Bruce was born in India, but was brought back to England as a child and entered the chemical industry at the early age of 15, when he joined the firm of Hugh Wallace & Co., chemical manufacturers, of Battersea, of which he became a director when he was 48. In 1915 he founded his own firm, which with the expansion of business ten years later was turned into a limited company. In 1945 he retired, but continued to take a keen interest in the business.

As one of the oldest members of the chemical trade of London and the South of England, Mr. Bruce was highly esteemed and was well-known as an arbitrator. He was very well-known as a supplier of chemical products to user industries. When he retired, his position was taken over by his youngest son, Captain T. F. Bruce, M.B.E., who will continue to carry on the business.

The ashes of MR. JOSEPH FUSSELL, who was employed at a chemical works at Crymlyn Burrows, Swansea, for a great many years, and who has died at the age of 102 in Johannesburg, are to be sent to Swansea for interment in his wife's grave. Mr. Fussell went to Johannesburg to live with his son when he was 70.

The death has occurred of MR. FRANCIS GORDON C. SANDYS, of Windyhaugh Lymm, near Warrington, who for more than 20 years was associated with the Grove Dye Works at Rochdale, latterly as chairman of the concern. He retired 15 years ago from active business life, but for a number of years he was chairman and a director of Fothergill & Harvey, Ltd., of Peter Street, Manchester.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AMBER CHEMICAL CO., LTD., London, S.W. (M., 16/2/52). 11 January, debenture to Swiss Bank Corporation securing all moneys due or to become due to the bank from Amber Chemical Industries Ltd., or the company; charged on rosin owned by the company and used for the purposes of their business and stored from time to time at the company's Cubitt Town Wharf, Wharf Road, Poplar. *Nil. 14 June, 1951.

PHOTO-CHEMICAL CO., LTD., London, W.C. (M., 16/2/52). 18 January, £4,000 debentures, part of a series already registered. *Nil. 31 December, 1950.

UNIVERSE PETROLEUM CO., LTD., London, E.C. (M., 16/2/52). 11 January, charge to Midland Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. 5 October, 1951.

Increases in Capital

The following increase in capital has been announced:—**OVERSEAS CHEMICAL EXPORT CO., LTD.**, from £2,000 to £5,000; **BRENT CHEMICAL PRODUCTS, LTD.**, from £500 to £5,000; **RUMEX OIL PRODUCTS, LTD.**, from £10,000 to £90,000.

New Registrations

F. R. Jones Ltd.

Private company. (503,956). Capital £1,000. Manufacturers of precision scientific glassware, medical and surgical glassware, etc. Directors: F. R. Jones, D. R. Jones, and W. A. Lee. Reg. office: 271 Liverpool Road, N.I.

Tobal Products Ltd.

Private company. (503,874). Capital £100. Manufacturers of chemical, pharmaceutical and biological products. First directors are not named. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

Petrochemicals' Progress

A MORE hopeful period seems to lie ahead of Petrochemicals, Ltd. The supply of chlorine, purchased from outside sources, plays an important part in the revenue position of the company. It is now hoped that deliveries during the first quarter of 1952 will reach total requirements by help of additional supplies, partly from abroad.

All the plants are now operating, most of them at, or better than, rated capacity. The average naphtha throughput during the last six months has been at a rate of 80,000 tons a year, which is in excess of the rated capacity. A further general expansion has also taken place on the sales side.

In his review of 1950-51, Sir Robert Renwick, chairman of the company, points out that the accumulated debit of the group of £2,025,296 as at 30 June, 1951, accords with the estimate which he gave in his last statement. Since the beginning of the present financial year current revenue expenditure, excluding interest, has been covered by current income. Sir Robert points out that during the financial year ending 30 June, 1952, there will inevitably be a further loss after making provision for depreciation and interest, while unsettled market conditions prevalent to-day make any forecast of future results impracticable.

However, the good progress being made would reconcile stockholders to the borrowing of another £1,000,000 from the Finance Corporation for Industry and to the prolongation of the present moratorium on the interest payable on the company's fund debt due to end on 31 March.

Delays in delivery of plant and 'teething troubles' have delayed development, but the period of running in is now substantially over.

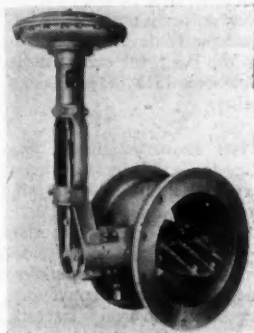
Publications & Announcements

'FERTILISER Trends and Future Prospects' were discussed by H. V. Cunningham in a paper read to the Agriculture Section of the British Association for the Advancement of Science, last August. Changes, he warned, must be slow. New fertiliser products and new practices in the use of fertilisers must serve a long probation in terms of factory techniques and costs as well as in terms of agronomic and economic evaluation. The paper is reproduced in the December issue of *The Advancement of Science* (Vol. 8, No. 31) published by the British Association. Another interesting article is by Dr. P. F. R. Venables in which he makes some comparisons on the different aspects of technical education in the U.S.A. and in Great Britain, following his visit to America.

CONTINUED growth in size and usefulness is evident in the 1952 edition of 'The Electrician Blue Book,' which, in its 70th year, retains unchallenged the position it has always occupied, of being the only comprehensive directory of the British electrical and allied industries it is designed to serve. The various sections covering the activities of every branch of the industry are now arranged in what is believed to be a more convenient order. Over 1,000 new names have been added to the Trade Names Section. It consists of 1,337 pages and contains nearly 60,000 references. It can be obtained from Benn Brothers Ltd., 154 Fleet Street, London, E.C.4, price 90s. including postage.

A NEW publication has recently made its appearance under the title of *Resin Review*, published for users of synthetic resins by the Resinous Division of the Rohm & Haas Company of Philadelphia. It is planned that the magazine shall appear some six times a year, articles appearing in it normally being more technical than those in the same company's 'Rohm & Haas Reporter.' Its general aim is to give the reader information which will help him to solve his manufacturing problems in the field of coating resins, adhesives, paper resins, oil additives, plasticisers and ion-exchange resins. The second issue, dated November 1951, contains a page on short topics, articles on the acryloid resins as finishes, a new alkyd triazine, the tapeless splicing of wood veneers, etc.

A NEW range of butterfly valves suitable for chemical plants, oil refineries, large low-pressure gas lines in steel works and other industrial applications has recently been added to its series of ported valves, pressure regulators, and other specialities for automatic control by the Fisher Governor Co., Ltd. The new valves are available in sizes



A Fisher motor diaphragm-operated butterfly valve

4-24 in. and control the flow of the fluid by a disc on a rotary shaft linked in a simple manner to a pneumatically operated diaphragm motor. The discs are shaped and ribbed for maximum strength and offer minimum resistance to fluid flow. In the closed position the clearance area between the disc and body does not exceed 0.5 per cent of the total pipe area. Standard diaphragm pressure range is 3-15 lb. sq. in. and for automatic pressure regulation the Fisher Wizard pilot can be mounted integral with the diaphragm casing. The Fisher Positrol valve positioner can also be fitted if required.

THE IMPERIAL College of Tropical Agriculture has published the report of its governing body and its Principal's report for 1949-50. The College suffered a very severe loss in 1949 on the death of its chairman, Sir Frank Stockdale, G.C.M.G., C.B.E., and lost several other much valued members at about the same time. The College is situated at St. Augustine, eight miles to the East of Port of Spain, Trinidad, and the report may be obtained from the Secretary, 40 Norfolk Street, London, W.C.2.

AIRCRAFT Specification D.T.D.716 has recently been published by the Ministry of Supply. This covers aluminium-silicon-magnesium alloy ingots and castings (as cast) and gives specifications for inspection and testing procedure, quality of material, chemical composition, heat treatment and tensile test. The specification is one of a series issued by the Ministry either to meet a limited requirement not covered by any existing British Standard Specification, or to serve as a basis for inspection of materials, the properties and uses of which are not sufficiently developed to warrant submission to the B.S.I. for standardisation. It is available from HMSO (6d.) or from any bookseller.

* * *

THE January-June edition of 'Transport Goods Guide' has now been published. This provides information on all forms of goods transport—road, rail, air, canal and sea throughout England, Scotland and Wales.

An important new feature is a list of manufacturers of materials handling equipment including conveyors, cranes, fork trucks, industrial tractors, and trucks, pallets, winches, etc.

The other sections, which have all been brought up-to-date, are: Transport services ABC, machinery carriers, bulk liquids carriers, ferry services, shipping services (home and coastwise), London public wharfers, public warehouse keepers and goods by air.

The guide costs 2s. 6d., including postage, and copies can be supplied by all newsagents and booksellers, or obtained direct from the publishers, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

* * *

A MONTHLY publication issued by Foster D. Snell Inc., of New York, *Chemical Market Reports* (C.M.R.), is an up-to-date account of many things of interest to chemical manufacturers and merchants as it gives full accounts of business and technical activities of most of the important chemical firms, not only in the United States but in Europe and elsewhere. In addition to this data, comprehensive lists of new trade marks are given. The sections are divided as follows: 1, Companies; 2, Industries; 3, Chemicals.

The average number of pages per issue is approximately 150 and reproduction is by a photographic process from approximately

quarto typed matter (elite type). In addition to the general matter, and to be found especially in Section III (Chemicals), is very useful and new information on new products and developments with business and technical data of use to manufacturers, technicians and research staffs interested in fine chemicals, pharmaceuticals, intermediates, heavy chemicals, metals, etc.

The C.M.R. can be obtained in this country from Dr. M. A. Phillips and associates, of 14 Western Road, Romford, Essex, from whom also specimen copies are available for inspection. Subscription rates (in sterling) can also be obtained from this organisation, which states that in addition to subscription arrangements, arrangements for supplying single copies can be made.

* * *

LARGE-SCALE production of the new American rodenticide Warfarin, which has had such good reports recently, is now being undertaken in the U.K. by Prior Chemicals Limited, Picton Street, Lower Broughton, Manchester, 7. The company is a subsidiary of Featly Products Ltd., synthetic resin manufacturers, and they have had their product approved by the Ministry of Agriculture and Fisheries for use by local authorities, in the form of a master mix containing 0.1-0.5 per cent by weight pure Warfarin in fine oatmeal, for mixing with medium oatmeal in the proportion of 5 per cent by weight. This produces a final concentration of 0.005 per cent and 0.025 per cent for use against the common rat and ship rat respectively.

* * *

PURE oxide ware for process and research work is the subject of a new leaflet now available from the Morgan Crucible Co., Ltd., of London. 'Triangle' fused alumina (alumina content 90-91 per cent) is suitable for use in contact with noble metals. It is stable in reducing atmospheres at high temperature, and therefore normally employed with molybdenum or tungsten resistance heaters in an atmosphere of hydrogen or cracked ammonia. 'Triangle' pure alumina (alumina content 99 per cent), has similar properties but can be used at temperatures up to 1,800°C. 'Triangle' recrystallised alumina (alumina content 99.7 per cent), can be used up to a temperature of 1,950°C. It is suitable for a wide range of high temperature melting and heat treatment processes.

THE PORTABLE 'DEMINROLIT' PLANT



DISTILLED QUALITY WATER AT LOW COST

Many industries need water of distilled quality, but distilled water is expensive. The modern equivalent is demineralised water — produced cheaply, without heat, by Permutit's portable "Deminrolit" plant.

This modern aid to industry produces distilled quality water at a fraction of the cost of distillation. Operating by ion exchange, it delivers a water free from dissolved solids — water suitable for countless needs hitherto satisfied only by expensive distilled water.

The portable "Deminrolit" plant shown here connects by flexible tube with any clean supply of cold water: it can be moved and used wherever the demineralised water is required. Why not send for Technical Publication No. 62 giving full details?

PERMUTIT

The
PERMUTIT Co. Ltd., Dept. V.A.102, Permutit House, Gunnersbury Avenue, London, W.4 CH1swick 6431

Next Week's Events

MONDAY 18 FEBRUARY

Society of Chemical Industry

London: The Royal Institution, Albemarle Street, W.1, 6 p.m. Jubilee Memorial Lecture of the Society. Professor Niels Bjerrum: 'The Structure and Properties of Ice'.

Royal Institute of Chemistry

Leeds: University, 6 p.m. Dr. G. Gee: 'Some Equilibria and Reactions of Sulphur'.

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1. E. S. Spencer-Timms: 'Some Physical and Thermal Properties of Chromium Deposits'.

Textile Institute

London: Burlington House, Piccadilly, W.1, 7 p.m. 'New Fibres'.

TUESDAY 19 FEBRUARY

Society of Chemical Industry

London: Royal College of Science, S.W.7, 2.30 p.m. Agricultural Group. A. G. Pollard (Imperial College): 'Sidelights on Soil Science'.

Royal Institute of Chemistry

London: Norwood Technical College, Knight's Hill, S.E.27. Dr. E. Seymour: 'The Chemotherapy of Tuberculosis'.

The Chemical Society

Leicester: University College, 5 p.m., with Leicester University College Chemical Society. Professor R. D. Haworth: 'The Chemistry of the Tropolones'.

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Physical Methods Group. Meeting on 'Electrographic Analysis'.

Textile Institute

Bradford: Midland Hotel, 7.15 p.m. G. Loasby: 'Recent Developments in Synthetic Fibres in the U.S.A.'.

Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. F. C. Lant and Dr. J. C. Weston: 'An Investigation of Whole-House Heating'.

Incorporated Plant Engineers

Glasgow: Engineering Centre, Sauchiehall Street, 7 p.m. Powel Duffryn Technical Services Ltd.: 'General Furnace Design and Operation'.

Institute of Petroleum

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. J. B. Matthews: 'Developments in Laboratory Methods and Technique'.

Institute of Physics

London: 47 Belgrave Square, W.1, 5.30 p.m. Electronics Group. Dr. J. M. Thoday: 'The Mechanism of Radiation-Induced Chromosome Mutation'.

WEDNESDAY 20 FEBRUARY

Royal Institute of Chemistry

London: Waldorf Hotel, Aldwych, W.C.2, 6 p.m. Dr. R. L. Kenyon (European representative, American Chemical Society): 'Organisation of the Chemical Profession in the U.S.A.'.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 5.15 p.m. Fernhurst Lecture. Sir William Ogg (director, Rothamsted Experimental Station): 'Modern Developments in Soil Science'. The Earl of Radnor will preside.

Incorporated Plant Engineers

Bristol: Electricity House, Colston Avenue, 7.15 p.m. Film and lecture: 'The Manufacture of Glass and Its Applications'.

Institute of Petroleum

Chester: Grosvenor Hotel, 7.30 p.m. Professor R. J. Sarjant and W. Hulse (University of Sheffield): 'Thermal Factors in Furnace Design'.

Institution of Electronics

Manchester: College of Technology, 7 p.m. S. R. Wilkins: 'Development in Multi-Range Electronic Measuring Instruments'.

THURSDAY 21 FEBRUARY

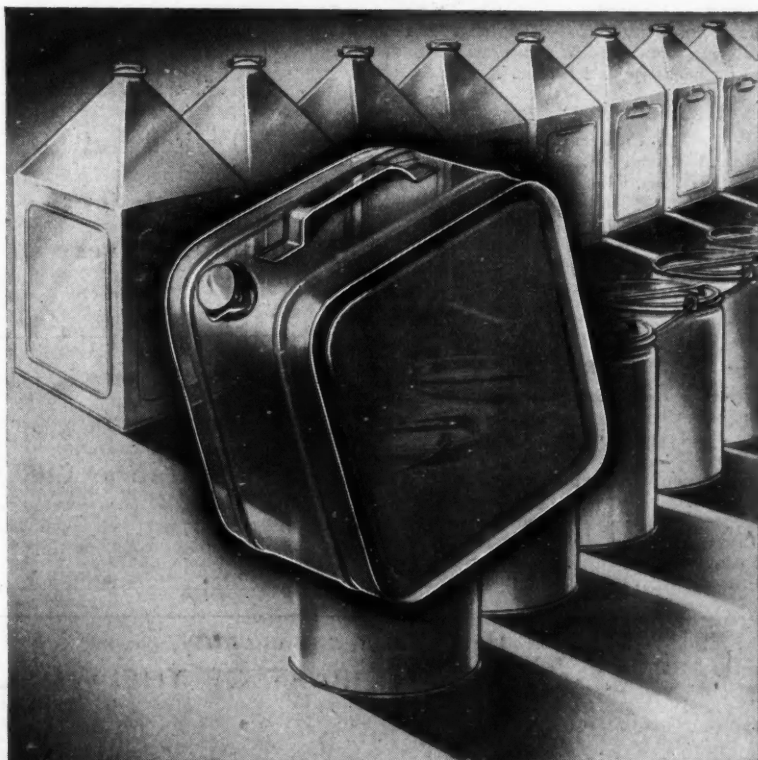
The Chemical Society

Edinburgh: North British Station Hotel, 7.30 p.m. Joint meeting with RIC and SCI. Dr. A. T. Green: 'Recent Trends in Refractories Research'.

Hull: University College, 6 p.m. Professor L. Hunter: 'La Liaison d'Hydrogène'.

London: Burlington House, Piccadilly, W.7, 7.30 p.m. Centenary Lecture. Professor T. Reichstein (Basle, *Honorary Fellow*): 'The Chemistry of the Cardiac Glycosides'.

(Continued on page 292)



In the Picture -

• SQUARE TAPERS. 2 & 5 GAL CAPACITY.

• P.T.L. KEGS. 6" TO 14" DIAMETER.

• ROBBICANS. 5 GALLON CAPACITY.

F. ROBINSON & CO. LTD.

SOUTHCOATES LANE • HULL • TELEPHONE 31818-7

Sheffield: University, 5.30 p.m., with Sheffield University Chemical Society. Dr. J. Walker: 'Some Recent Contributions of Organic Chemistry to Medicine'.

FRIDAY 22 FEBRUARY

The Chemical Society

Newcastle-upon-Tyne: King's College, 5.30 p.m. Bedson Club Lecture. Professor D. H. Everett: 'There and Back Again. Some Aspects of Hysteresis'.

St. Andrews: United College, 5.15 p.m., with St. Andrews University Chemical Society. Sir John Cockcroft: 'Scientific Developments in the Field of Atomic Energy'.

SATURDAY 23 FEBRUARY

Royal Institute of Chemistry

Reading: University, 2.30 p.m. A symposium on 'The Metabolism of Calcium and Phosphorus'.

Institution of Chemical Engineers

Manchester: Reynolds Hall, College of Technology, 3 p.m. N. Gavron: 'The Role of Patents in Industrial Research and Development, with Particular Reference to the Chemical Industry'.

Lithopone

30% Red Seal

**Available for
prompt delivery**



A Harris & Dixon Company

Guest Industrial Ltd.

Raw Materials Division

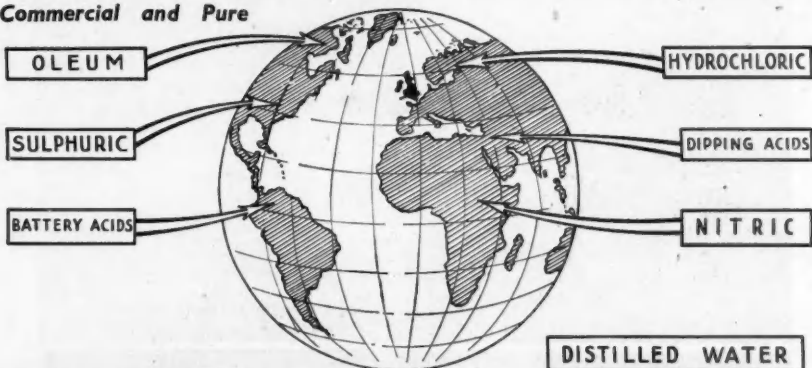
81, Gracechurch Street, London, E.C.3

Telephone: Mansion House 5631 (16 lines)
Telegrams: Guesind, London

ACIDS

Delivered in any quantity
TO ANY PART OF THE WORLD

Commercial and Pure



SPENCER CHAPMAN & MESSEL, LTD.

45, PARK LANE, LONDON, W.1.

Telephone: GROSVENOR 4311 (4 lines) Telegrams: "HYDROCHLORIC, AUDLEY, LONDON."
Works: SILVERTOWN, E.16.



Motor car assembly — pit beneath assembly line for under-chassis work

Better lighting means fewer errors

REJECTS CAN BE EXPENSIVE in line production, and poor lighting is a main cause of faulty work. The better your lighting, the better the job people can do, and the fewer errors they will make. With the latest type of fluorescent lighting, you not only *save power and money*, but you get better light—and more of it. By installing better lighting you can get better and faster work, and use the available electricity more efficiently.

WHERE TO GET MORE INFORMATION

Your Electricity Board will be glad to help you to get the utmost value from the available power supply. They can advise you on ways to increase production by using Electricity to greater advantage—on methods which may save time and money, materials and coal, and help to reduce load shedding. Ask your Electricity Board for advice: it is at your disposal at any time.

Electricity for PRODUCTIVITY

Issued by the British Electrical Development Association

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMIST required. Degree or H.N.C. Standard with experience in metal analysis and protective treatment preferred. Apply **PERSONNEL MANAGER, THE FAIRY AVIATION CO., LTD., HAYES, MIDDLESEX.** stating age and salary required.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for permanent appointments to be filled by competitive interview during 1952. A closing date for the receipt of applications earlier than December, 1952, may eventually be announced either for the competition as a whole or in one or more subjects. Interviews will be held shortly after the receipt of the completed application form and successful candidates may expect early appointments.

The posts are divided between the following main groups and subjects:—

- (a) Mathematical and Physical Sciences;
- (b) Chemistry and Metallurgy;
- (c) Biological Sciences;
- (d) Engineering Subjects; and
- (e) Miscellaneous (including, e.g., Geology, Library and Technical Information Services).

AGE LIMITS—For Experimental Officers, at least 26 and under 51 on December 31st, 1952, for Assistant Experimental Officers at least 18 and under 28 on 31st December, 1952. Extension for regular service in H.M. Forces.

Candidates must have obtained, or be taking examinations during 1952 with a view to obtaining, the Higher School Certificate with Mathematics or a Science subject as a principal subject, or the General Certificate of Education in appropriate subjects, or the Higher National Certificate or other specified qualifications. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Candidates over 20 will generally be expected to have higher qualifications.

Inclusive London Salary Scales:—

Experimental Officer, £575-£725 (men); £485-£600 (women).

Assistant Experimental Officers, £250-£535 (men) £250-£445 (women).

Somewhat lower rates in the provinces.

Further particulars and application forms from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1.** quoting No. 894-95/52. Completed applications forms should be returned as soon as possible. 13775/120/EH

VACANCY OCCURS on Senior Technical Staff of Works producing Sulphuric Acid, Synthetic Ammonia by low-temperature gas separation, and Sulphate of Ammonia. Applicants to be Chemical Engineers with good qualifications and with considerable industrial experience. Duties include full control of Production Departments through Plant Managers. Salary according to qualifications and experience. Pensions Scheme. House if necessary. Applications to **GENERAL MANAGER, NITROGEN FERTILISERS LIMITED, FLIXBOROUGH, NEAR SCUNTHORPE, LINCOLNSHIRE.**

PATENTS & TRADE MARKS

The Proprietors of Patent No. 613,106 for "Improvements in or relating to Polyhydric Phenol-Aldehyde Resin Adhesives" desire to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to **HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.**

FOR SALE

MORTON, SON & WARD LIMITED

—OFFER—

the following

FOUR Stainless Steel **MOTORISED AGITATORS**, direct coupled to 5 h.p. geared motors, 2-in. stainless steel shafts, 3-bladed propellers, 180 r.p.m. As new.

ONE Stainless Steel Motorised **AGITATOR** by MITCHELL, 1 h.p. with adjustable shaft and two adjustable 2-bladed propellers. For vertical mounting with clamps.

TWO 200-gallon, Open Top, **STAINLESS STEEL TANKS**, 20's gauge.

ONE **STAINLESS STEEL TANK**, 5 ft. by 4 ft. 3 in. by 3 ft., in timber cradle, 20's gauge.

THREE Enamel-lined **EVAPORATING or CRYSTALLISING PANS** by PFAUDLER, capacity 30 gals. arranged with jackets for 30 lb. p.s.i. w.p.

ONE 1,500-gallon **JACKETED BOILING PAN**.

TWO c.i. Sectional Cylindrical **TANKS**, 7 ft. diam. by 3 ft. 6 in. deep. As new.

ONE Rectangular Sectional c.i. **TANK**, 20 ft. by 10 ft. by 1 ft. 6 in. deep.

A large selection of **VESSLS** in stock which can be arranged with mixing gear and/or coil heating. Motorised or fast and loose pulley drive.

HYDRO EXTRACTORS

ONE 72 in. by **BROADBENT**. Steel basket. Direct underdriven, 3-point suspension.

ONE 60 in. by **BROADBENT**. Vulcanite covered basket. As above.

ONE 48 in. by **BROADBENT**. Steel galvanised basket. Underdriven through Vee ropes from vertical mounted motor.

THREE 42 in. by **WATSON LAIDLAW**. Copper tinned baskets. Underdriven through Vee ropes from flange-mounted vertical spindle motor; 3-point suspension.

ONE 30 in. by **BROADBENT**. Steel basket. Lift-type. Underdriven through flat belt from flange-mounted vertical spindle motor. Spare basket available.

All machines suitable for 400/350 supply and complete with cabinet starters.

'MORWARD' 'U' shaped **TROUGH MIXERS** from 16 to 100 cu. ft. capacity with scroll-type mixing gear.

Inquiries invited.

MORTON, SON & WARD LIMITED

WALK MILL,

DOBBOSS, NR. OLDHAM,

LANCS.

Phone: Saddleworth 437.

CHARCOAL, ANIMAL AND VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal-insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E.** TELEGRAMS: "HILL-JONES, BOCHURCH, LONDON," TELEPHONE: 3285 EAST.

DDT and Carrier can be ground to 250 mesh with Nedalo Screenless Mill. Write for demonstration, **CALLOW (ENGRS.), LTD., KIRKBY TRADING ESTATE, LIVERPOOL.**

GRAVITY Roller Conveyor several lengths. Rolls 24 in. diam. by 16 in.; 3 in. centres. Good condition. **THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET, MILLWALL, E.14.** (Tel. East 1844.)

FOR SALE

600

STRIP PICKLING AND WASHING PLANT, comprising 33 ft. centres by 104 in. Acid-resisting Horizontal Link **CONVEYOR**, motorised 400/3/50; lead-lined **PICKLING CHAMBER**, 5 ft. long by 2 ft. by 2 ft., with four 1-in. spray pipes supplied from totally enclosed lead-lined **TANK** 7 ft. 6 in. by 2 ft. by 2 ft.; armoured **Vitron ACID PUMP**, motorised; **WASHING CHAMBER**, 21 ft. long with totally enclosed **LEAD LINED TANK**, 6 ft. by 2 ft. by 2 ft.

2—Vertical **GAS COOLERS**, each approx. 12 ft. diam. by 55 ft. high, constructed 12 mm. plate, tile lined and part filled ceramic rings, with water spray diffusers and all fittings, including cool water pumps. Capacity of each Cooler, 29,000 M³/hour (1,020,000 cu. ft. per hour), cooling from 220° to 20° C.

3—**AIR FANS** by Carl Encke & Co., type VL6. Capacity, 15,000 M³/hour (530,000 cu. ft. per hour), end pressure 1.1 atm. (16 p.s.i.), 1,000 mm. (40 in.) water column, 500 mm. (20 in.) i.d. suction, 400 mm. (16 in.) i.d. pressure. Approximately 80kW. (100 h.p.) required to drive.

2—**FANS** by Benno Schilde. Capacity, 29,500 M³/hour (1,040,000 cu. ft. per hour), 1000 mm. (40 in.) water column, for gas 220°C. Approximately 150kW. (200 h.p.) required to drive.

2—30 in. Oscillating **HYDRO EXTRACTORS**, with rubber-covered baskets, 39 in. by 16½ in. deep. 3-point suspension, 4 in. outlet in Monitor. Motorised 400/3/50.

3—Recessed Plate-type **FILTER PRESSES** by Manlove Alliott, with 60 plates 24 in. sq., 1 in. thick. Hand-operated ratchet and pinion closing gear.

GEORGE COHEN SONS & CO., LTD.

SUNBEAM ROAD, LONDON, N.W.10.

Tel.: Elgar 7222 and

STANNINGLEY, MR. LEEDS.

Tel.: Pudsey 2241

PUNCHES and DIES (Unused). Two sets, 7/16 in. diam. flat to fit "Manesty" D3 Rotary Tablet-Making Machine. Apply **BOX NO. C.A. 3110, THE CHEMICAL AGE**, 154, Fleet Street, London, E.C.4.

ROTARY DRYER, 40 ft. by 6 ft. diam. Maker, Wm. Johnson, driven by 24 H.P. slip-ring motor, 400 volts, 3 phase, 50 cycles, with motor-driven suction fan. Nearly new condition. Box No. C.A. 3109, **THE CHEMICAL AGE**, 154, Fleet Street, London, E.C.4.

SCREENLESS PULVERIZERS for fine grinding of Chemicals. Also **CYCLOONES, ROTARY VALVE FEEDERS**. Callow (Engrs.) Ltd. Kirkby Trading Est., Liverpool.

FREEHOLD FACTORY FOR SALE SURREY

(Close Town and Railway)

115,000 sq. ft. Site 7½ acres
EXTENSIVE single-storey and multi-storey brick and steel buildings, lifts, large boilers, generators, concrete roadways. Suitable for manufacture involving use of considerable quantities of water and steam. Price **FREEHOLD** £105,000. Vacant possession.

Sole Agents:

CHAMBERLAIN & WILLOWS,

28, Moorgate, E.C.2 (CITY 6013)

FOR SALE

VARIOUS MIXERS FOR SALE

FOURTEEN various open-top **STORAGE TANKS**, riveted, capacities from 300 gallons to 9,800 gallons. Last used for oil or varnish.

1½, 2½ and 3½ size belt-driven **DISINTEGRATORS** by Christy & Norris or Harrison Carter.

Size No. 3 Junior Hammamasc **HAMMER MILL** with fan and cyclone, also No. 1 size **Miracle GRINDING MILLS**.

Robinson 3-sheet No. 1 size **CENTRIFUGAL DRESSING MACHINE** for dry powders, etc.

Four **ROTARY BOWL MIXERS**, 5 ft. diam., cast iron built, inclined agitators, by Baker Perkins.

Kek GRINDING MILL, square pin type, with grinding discs 13 in. diam., including circular delivery bin with single outlet.

Large unjacketed **WERNER MIXER**, belt and gear driven, hand tipping, double "Z" arms, pass 58 in by 45 in by 36 in. deep.

No. 200 One nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR**. Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fan-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER**, steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

Two **FILTER PRESSES**, each fitted 63 wood recessed plates, 2 ft. 8 in. square, centre fed, with enclosed bottom corner delivery, cloth clips and beltings.

One **DEHNE FILTER PRESS**, cast iron built, fitted 45 recessed ribbed plates, 2 ft. 8 in. by 2 ft. 8 in. by 1½ in., with bottom corner feed, cloth clips and bottom corner separate outlets, angle lever closing gear, etc.

SIMON HORIZONTAL TUBULAR STEAM HEATED DRIER, barrel with steam-heated tubes, 12 ft. long by 5 ft. diameter.

Further details and prices upon application

Write **RICHARD SIZER LIMITED, ENGINEERS, CUBER WORKS HULL**

STEEL VESSELS FOR SALE

24 All-Welded Vertical Steel Tanks.

5' high x 3' 6" diam.

New Condition.

9 All-Welded Horizontal Steel Tanks.

8' long x 3' 6" diam.

MADEN & MCKER, LTD.,
317, PRESCOT ROAD,
LIVERPOOL, 13

FOR SALE

PHONE 98 STAINES

TWO ENCLOSED STEEL TANKS, 12 ft. 6 in. diam. by 9 ft. deep.

Unused **CONDENSERS**, 3 ft. 6 in. by 5 in. diam., brass shell, with 325 $\frac{1}{2}$ in. copper tubes; also two by "Weir" brass tubes, 100 sq. ft.

STAINLESS STEEL JACKETED Gas-heated **MIXER** (Enclosed), 36 in. by 22 in. diam.

Twin "Z" blade **TIPPING MIXERS**, 43 in. by 40 in. by 28 in., and 16 in. by 16 in. by 14 in.; also Lab. sizes.

Two-throw Wet **VACUUM PUMP**, 24,000 lb. p.h. **W.S. AUTOCLAVES**, all lengths up to 18 ft. by 2 ft. diam. 200 p.s.i. test pressure.

HARRY H. GARDAM & CO., LTD., STAINES.

TWO excellent Lancashire **BOILERS**, about 30 ft. by 7 ft. 6 in., 170 lb., working pressure with all fittings and belongings. Very reasonable price for prompt loading, ex Mill.

RICHARD SIZER, LIMITED, ENGINEERS, CUBER WORKS, HULL. TELEPHONE 51743.

1 Barron "D" **MIXER, TROUGH** 30 in. by 18 in. by 18 in. Vee-belt drive to 2 H.P. motor, 750 revs. 400/3/50. As new.

One Werner Type **MIXER, TROUGH** 36 in. by 30 in. by 28 in. Twin "Z" blades, power tilted, fast and loose pulley drive.

THOMPSON & SON (MILLWALL) LIMITED, CUBA STREET, MILLWALL, E.14 (Tel.: East 1844)

4 Stainless steel **TILTING PANS**, 40-gallon capacity, 50/60 lb. working pressure, complete throughout.

2—Copper **TILTING PANS**, 40-gallon capacity, 50/60 lb. working pressure, complete throughout.

2—Copper **TILTING PANS**, laboratory sizes. W.P. 60/80 lb.

1—"Barron" "U" type **MIXER**, complete with F.L. pulleys. Mixing arms gear driven. Measurements, 44 in. by 18 in. by 18 in.

1—Heavy **MIXER C.I.** throughout, fitted with six blades (dough mixer), gear driven mixing arms. Measurements, 16 in. long by 20 in. wide by 26 in. deep, by **BAKER.**

DISINTEGRATORS, granite edge **RUNNER MILLS**, small porcelain **PEBBLE MILLS.**

Apply **BOX NO. C.A. 3107, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

2400 kW MOTOR GENERATOR SET

suitable for electrolytic and similar processes. Makers, Metropolitan Vickers, input 3500 h.p. Synchronous motor, 11,000 volts 3 phase 50 cycles, output 3-800 kW, generators operating in parallel, output each 1600 amperes 0/500 volts, separately excited with compensating windings for stability over voltage range, speed 1000 r.p.m. Whole unit including exciters on combination baseplate. For full details with drawing apply:

GEORGE COHEN, SONS & CO., LTD.,

WOOD LANE, LONDON, W.12

Tel.: Shepherds Bush 2070 and

Stanningley, Mr. Leeds

Tel.: Pudsey 2241

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON
(Established 1855).

Auctioneers, Valuers and Fire Loss Assessors of
CHEMICAL WORKS, PLANT AND MACHINERY

York House, 12 York Street, Manchester.

Telephone 1937 (2 lines) Central, Manchester.

ANNOUNCEMENT

ALKALI, etc., WORKS REGULATION (SCOTLAND) ACT, 1951. The Inquiry into the proposed Order under the above Act advertised to be held on Friday, February 15th, at 10.45 am. at St. Andrew's House, Edinburgh, 1, has been postponed until Friday, March 7th, at the same time and place.

G. MACROBBIE,
Assistant Secretary.

Department of Health for Scotland,
St. Andrew's House,
Edinburgh, 1.

SERVICING

ATOMS AND MOLECULES. DOHMS reduce some materials to Atoms and Molecules. 14 factories for pulverising and refining industrial raw materials. **DOHM, LTD., 167, VICTORIA STREET, S.W.1.**

CRUSHING, GRINDING, MIXING AND DRYING for the trade.

THE CRACK PULVERISING MILLS, LTD.,
Plantation House,
Mining Lane,
London, E.C.3.

GLASSBLOWING by **HALL DRYSDALE & CO. LTD., 58, COMMERCE ROAD, LONDON, N.22.** (Telephone: BOWes Park 7221.)

GRINDING of every description of chemical and other materials for the trade with improved mills. **THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH, LONDON," TELEPHONE: 3385 EAST.**

ALTRINCHAM JUTE LTD.

Sacks and Bag Merchants and Manufacturers.
Buyers and Sellers of used jute sacks for
Home and Export for all purposes

25, VIADUCT ROAD, BROADHEATH, ALTRINCHAM, CHESHIRE. Tel.: ALTRINCHAM 4360

NORTON & RIDING (YORKSHIRE) LTD.

Chemical Plumbers & Leadburners

On Ministry of Supply List

Contractors to N.C.B.

LEAD-LINED TANKS, COILS AND VATS

SULPHURIC ACID PLANT

HOMOGENEOUS LEAD LINING

LEAD WORK FOR DYEWORKS and EXPLOSIVES

SATURATORS and BENZOLE WASHERS

Reg. Office

66 Westfield Road,

Heaton, BRADFORD.

Tel.: 42765 & 44868

Works

New Works Road,

Low Moor,

BRADFORD

TANTIRON

SILICON IRON

*pipes, vessels & fittings
for handling Corrosives*

Tantiron, the registered trade name applied to Silicon iron castings, was first cast and produced on a commercial scale by The Lennox Foundry Co. before 1910, so we are well justified in our claim that it is the first—and still the best—high silicon resisting iron.

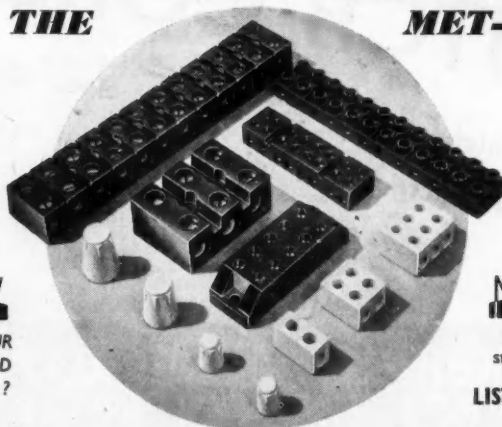
Tantiron is manufactured into Pumps, Valves, Dephlegmators, Pipes, Cocks, Absorption Towers, Pans, Reaction Vessels, Coolers, etc.

Tantiron resists most of the known persistent corrosive agents. Tantiron Pipes, Valves and Fittings are subject to a hydraulic test of 50 lbs. per sq. inch before despatch and test certificates furnished when requested.



LENNOX FOUNDRY CO., LTD.,
Tantiron Foundry, Glenville Grove, London, S.E.8.

MAKING CONNECTIONS THE MET-WAY



METWAY
PRODUCTS

HAVE YOU OUR
ILLUSTRATED
CATALOGUE ?

METWAY
PRODUCTS

Send 6d. in
stamps and ask
for
LIST No. JJ3/CA

METWAY ELECTRICAL INDUSTRIES LTD.

KING STREET, BRIGHTON, 1
Tel.: Brighton 28366 Grams: Metway, Phone, Brighton

BRONZE & ALUMINIUM

FOUNDERS

TO THE CHEMICAL INDUSTRY

CHILL CAST PHOSPHOR BRONZE BAR

E. JACKSON & CO.

LORD STREET, MANCHESTER, 10

Telephone : Collyhurst 3016

JOHN KILNER & SONS (1927) LTD

ESTABLISHED 1867

Calder Vale Glass Works, Wakefield, Yorks.

PHONE: WAKEFIELD 2042 GRAMS: GLASS, WAKEFIELD

SPECIALISTS IN**Carboys · Demijohns
Winchesters****CHARLES WALLIS & SONS (SACKS) LTD.**Sacks and Bags for all purposes always
in Stock and Ready for Delivery

HEAD OFFICE & WORKS:

90, CAMBERWELL RD., LONDON, S.E.5

Telephone : Rodney 3996

Grams : " Wallisacks, Camber, London."

ALSO

MODEL FACTORY: 32-34 BRADBOURNE

ROAD, SEVENOAKS, KENT.

Telephone : Sevenoaks 4934

Decolorising CARBON**HIGHEST EFFICIENCY****LOWEST PRICES**ALL GRADES
FOR
ALL TRADES**Granular Carbon for Solvent Recovery.
Regeneration of Spent Carbon.**

Write for samples and quotations.

FARNELL CARBONS LIMITED

CONDUIT ROAD, PLUMSTEAD, LONDON, S.E.18

Telephone:
Woolwich 1158 (2 lines).Telegrams:
Scofar, Wol, London.**PITCH COKE**a high purity carbon for electrode
manufacture and other industrial use.Deliveries can be given in
bulk or bags.**YORKSHIRE TAR DISTILLERS LTD
CLECKHEATON, YORKS.**TEL. CLECKHEATON
790 (5 LINES)TELEGRAMS TO-
YOTAR CLECKHEATON

Drying Trays

- IN HARD RESISTANT VITREOUS ENAMEL
- SPECIALLY PROCESSED TO GIVE MAXIMUM SERVICE
- ALL CORNERS AND EDGES ROUNDED
- SIZES TO SUIT CUSTOMERS REQUIREMENTS
- FINISHED IN GREEN OR OTHER SELECTED COLOUR

NATIONAL ENAMELS LTD.
53, NORMAN ROAD, GREENWICH
LONDON, S.E.10.

Telephone: Greenwich 2266-7 and 2429

CALLOW ROCK

Gas-Burnt

LIME

for all purposes

QUICKLIME

(Calcium Oxide)

of the highest commercial quality,
in lumps or in coarse powder form

HYDRATED LIME

(Calcium Hydroxide)

in Standard and Superfine grades to
meet most industrial requirements

The Callow Rock Lime Co. Ltd.
CHEDDAR, Somerset

Agents: DURHAM RAW MATERIALS, LTD.,
1-4, Great Tower Street, LONDON, E.C.3.

ACID-PROOFING BY

A COMPREHENSIVE ORGANISATION FOR ALL TRADES & INDUSTRIES
for Floors · Channels · Tanks (storage & process) · Drainage
Neutralising · Chimney & Tower Linings (Chemical)

PRODORTE

Established
2½ Years.



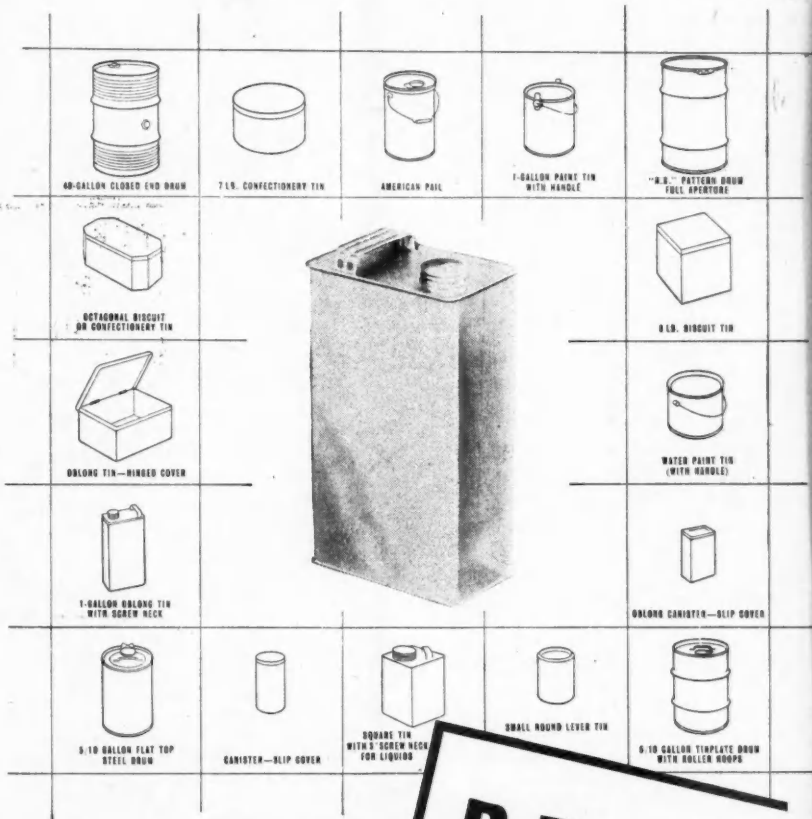
Battery of Heavy Duty Pickling Tanks & Acidproof Floor & Channels.

Head Office & Works :
WEDNESBURY, STAFFS.

Telephone : 0284
(five lines)

London Office :
Artillery House,
Artillery Row, S.W.1.

Tel: Abbey 3816
(five lines)



THE RIGHT CONTAINER for EVERY MARKET

Every market has its own packaging problems. In whatever parts of the world you are selling, a correct combination of style, size, design and colour of your metal containers is necessary. Reads of Liverpool have over 80 years' experience in the manufacture of plain and decorated tin boxes and steel drums — a continuity of experience that enables them to produce appropriate packages for specific uses.

READS LIMITED

Orrell House, Orrell Lane, Walton, Liverpool, 9. 'Phone: Aintree 3600
227 Grand Buildings, Trafalgar Square, London, W.C.2
Also at Glasgow, Belfast and Cork.

READS
OF LIVERPOOL
produce appropriate
packages for particular
people



We regret that the present shortage of tinplate and steel sheets makes it difficult for us to maintain supplies to customers at normal level.

RI141/3-C

1952

age of
fficult
omers

1141'3-C

ERS
ffice.